

CIEEM
Chartered Institute of Ecology and Environmental Management

GUIDELINES FOR ECOLOGICAL IMPACT ASSESSMENT IN THE UK AND IRELAND

Terrestrial, Freshwater, Coastal and Marine

September 2018

Version 1.1 - Updated September 2019

CONTENTS

AMENDMENTS AND CORRECTIONS 4
PREFACE 5
ACKNOWLEDGEMENTS 7
SUMMARY 8

1. INTRODUCTION 9
- Use of the Guidelines 10
- Differing Scales of EcIA and a Proportionate Approach 10
- A Rigorous and Transparent Approach 11
- Key Principles 12
- The EcIA Process 12

2. SCOPING 16
- Purpose and Objectives of Scoping 16
- The Scoping Process 17
- Conclusions of the Scoping Process 25

3. ESTABLISHING THE BASELINE 26
- Introduction 26
- Considering Other Development Projects when Predicting the Baseline 27
- Informing the Baseline 27
- Data 28

4. IMPORTANT ECOLOGICAL FEATURES 29
- Introduction 29
- Determining Importance 29

5. IMPACT ASSESSMENT 36
- Introduction 36
- Predicting Ecological Impacts and Effects 36
- Characterising Ecological Impacts 38
- Assessment of Cumulative Impacts and Effects 39
- Assessment of Residual Impacts 40
- Significant Effects 40
- Determining Ecologically Significant Effects 41
- Precautionary Principle 42
- The Marine Context 42
- Alternative Approaches 42
- Example Assessment of the Significance of Effects 43

6. AVOIDANCE, MITIGATION, COMPENSATION AND ENHANCEMENT 44
- Introduction 44
- Avoidance and Mitigation 44
- Compensation 44
- Enhancement 45
- Designing Mitigation and Compensation 45
- Delivery 46
- Reporting Mitigation, Compensation and Enhancement 46
- Monitoring 47

7. CONSEQUENCES FOR DECISION-MAKING 48
- Introduction 48
- Legal Implications 48
- Policy Implications 49
- Implications for Detailed Design and Implementation 49

APPENDIX 1 Example Assessment of the Significance of Effects (Terrestrial) 51
APPENDIX 2 Example Assessment of the Significance of Effects (Marine) 58
APPENDIX 3 Template for Ecological Impact Assessment 65
APPENDIX 4 Sources of Contextual Information 70
APPENDIX 5 Habitat Classification Systems 71
GLOSSARY 73
LIST OF ABBREVIATIONS 76
ENDNOTES 77

AMENDMENTS AND CORRECTIONS

Note: Minor typographical revisions and weblink updates will not be shown here but will be incorporated into the PDF version available on the CIEEM website on an ongoing basis

Paragraph ref.	Change	Date
3.12	Reference added to Appendix 5, which lists habitat classification systems	September 2019
4.13	Amendment to show that only formally proposed Natural Heritage Areas in Ireland are legally protected from damage.	September 2019
Appendix 5	Appendix added, listing example types of habitat classification systems	September 2019
Whole document	Revised format	September 2019

PREFACE

The Guidelines for Ecological Impact Assessment in the UK and Ireland (2018) combines the *Guidelines for Ecological Impact Assessment in the UK and Ireland: Terrestrial, Freshwater and Coastal, 2nd edition (2016)* and the *Guidelines for Ecological Impact Assessment in Britain and Ireland: Marine and Coastal (2010).*

The aim of the Guidelines is to:

- promote good practice
- promote a scientifically rigorous and transparent approach to Ecological Impact Assessment (EcIA)
- provide a common framework to EcIA in order to promote better communication and closer cooperation between ecologists involved in EcIA
- provide decision-makers with relevant information about the likely ecological effects of a project.

Biodiversity: Code of practice for planning and development[1] published by the British Standards Institute (BS 42020:2013) cites the CIEEM EcIA Guidelines as the acknowledged reference on ecological impact assessment. The Guidelines are consistent with the British Standard on Biodiversity, which provides recommendations on topics such as professional practice, proportionality, pre-application discussions, ecological surveys, adequacy of ecological information, reporting and monitoring.

This document should be referenced as:

CIEEM (2018) *Guidelines for Ecological Impact Assessment in the UK and Ireland: Terrestrial, Freshwater, Coastal and Marine* version 1.1. Chartered Institute of Ecology and Environmental Management, Winchester.

The following organisations have contributed to these Guidelines and have provided the statements below:

The Environment Agency provided advice to the development of this guidance and believe it has a good appreciation of the links between the coastal and terrestrial environment for operational, advisory, and regulatory roles.

Natural England contributed to the development of this document and see merit in its publication.

The Marine Management Organisation (MMO) promotes sustainable development in our marine area and delivers the Government aim for clean, healthy, safe, productive and biologically diverse oceans and seas. *The Guidelines for Ecological Impact Assessment in the UK and Ireland* provide a robust reference for undertaking EcIA assessments in our coastal and marine environment.

Marine Scotland Science welcomes this revision of CIEEM EcIA Guidelines as a contribution towards integration of EIA methods across terrestrial and aquatic environments.

The following organisations have contributed to and endorse these Guidelines

ACKNOWLEDGEMENTS

CIEEM would like to thank all those involved in the production of these Guidelines:

The Technical Review Group for these Guidelines included Richard Arnold, John Box (Joint Editorial Chair), Diane Corfe, Cameron Crook, Mike Dean, Bob Edmonds, Nathan Edmonds, Mick Green, Richard Knightbridge, Tom Mallows, Caroline McParland, Roger Morris (Joint Editorial Chair), Tim Norman, Graham Russell, Colin Scott, Duncan Watson and Jim Wilson.

Once again David Pape and Jacklyn Johnston (NatureConsult) brought significant technical expertise and practical insight to their role as editors. The Guidelines are a much-improved document for their input.

David Tyldesley (DTA Associates) contributed invaluable expert opinion in key areas.

CIEEM is also grateful for the significant contributions from Simon Boulter, Rhian Brimble, Paul Burgess, Larry Burrows, Mary Chadwick, Karen Colebourn, Angus Corby, Judith Cox, Kathy Dale, John Dobson, Katherine Drayson, David Dutton, Pete Etheridge, Helen Evriviades, Jim Fairclough, Josh Fothergill, Simon Geary, Mick Hall, Lorna Harris, Claire Lacey, William Latimer, Helen Lucking, Cameron MacIver, Chris Manning, Orla Maguire, James McCrory, Anne Murray, Steve Mustow, Jenny Neff, Tadhg O'Mahony, Mike Oxford, David Parker, Diana Reynolds, Paul Scott, Annie Say, Aedan Smith, George Smith, Andrea Taylor, Jon Taylor, Andre Thiel, Jo Treweek, Claire Wansbury, Sandra Wells, David Whitehorne, Mike Willis, Matthew Wilson, Stephanie Wray and Len Wyatt.

CIEEM would also like to acknowledge the support provided by the following organisations:

ABPmer
AMEC Foster Wheeler Environment & Infrastructure UK Ltd.
Association of Local Government Ecologists
Atkins Ltd
CEFAS
Chartered Institution of Water and Environmental Management
Crown Estate
Department of Agriculture, Environment and Rural Affairs (NI)
Ecology Matters
Environment Agency (England)
Institute of Environmental Management and Assessment
Jacobs UK Ltd
MD Ecology
National Parks and Wildlife Service (Ireland)
Natural England
Natural Resources Wales
NIRAS Consulting
Royal Society for the Protection of Birds
Scottish Environment Protection Agency
Scottish Natural Heritage
SLR Consulting Ltd
The Wildlife Trusts
Thomson Ecology

SUMMARY

The Chartered Institute of Ecology and Environmental Management (CIEEM) has developed these Guidelines to promote good practice in Ecological Impact Assessment (EcIA) relating to terrestrial, freshwater, coastal and marine environments in the UK and Ireland.

EcIA is a process of identifying, quantifying and evaluating potential effects of development-related or other proposed actions on habitats, species and ecosystems[2]. The findings of an assessment can help competent authorities understand ecological issues when determining applications for consent. EcIA can be used for the appraisal of projects of any scale including the ecological component of Environmental Impact Assessment (EIA). When undertaken as part of an EIA, EcIA is subject to the relevant EIA Regulations. Unlike EIA, EcIA on its own is not a statutory requirement. It is an evaluation process undertaken to support a range of assessments.

EcIA is a process that is most effective if all contributing ecologists and other specialists work in collaboration. An EcIA report (or the ecological chapter of an EIA Environmental Statement) should clearly and simply describe the significant effects of any project so that all interested parties understand the implications of what is proposed. These Guidelines explain the key elements of the EcIA process:

Chapter 1 – Introduction. Overview of the EcIA process and underpinning principles.

Chapter 2 – Scoping. Determining the matters to be addressed in the EcIA, including consultation to ensure the most effective input to defining the scope. Scoping is an ongoing process – the scope of the EcIA may be modified following further ecological survey/research and during impact assessment.

Chapter 3 – Establishing the baseline. Collecting information and describing the ecological conditions in the absence of the proposed project, to inform the assessment of impacts.

Chapter 4 – Important ecological features. Identifying important ecological features (habitats, species and ecosystems, including ecosystem function and processes) that may be affected, with reference to a geographical context in which they are considered important.

Chapter 5 – Impact assessment. An assessment of whether important ecological features will be subject to impacts and characterisation of these impacts and their effects[3]. Assessment of the significance of the residual ecological effects of the project (those remaining after mitigation), including cumulative effects.

Chapter 6 – Mitigation, compensation and enhancement. Incorporating measures to avoid, reduce and compensate negative ecological impacts and their effects, and the provision of ecological enhancements. Monitoring impacts and their effects. Evaluation of the success of proposed mitigation, compensation and enhancement measures.

Chapter 7 – Implications for decision making. Consideration of the legal and policy framework throughout the EcIA process.

1 INTRODUCTION

1.1 The purpose of these Guidelines is to promote good practice in Ecological Impact Assessment (EcIA) relating to terrestrial, freshwater, coastal and marine environments in the UK and Ireland.

1.2 The context of EcIA is well established. The EU Biodiversity Strategy[4] and national biodiversity strategies[5] reflect the need to conserve biodiversity[6] in the face of pressure from development, other land use change and climate change. These strategies reflect the aspirations of the Convention on Biological Diversity. International work on the benefits of nature to society (natural capital and ecosystem services), the UK National Ecosystem Assessment[7] and *The Economic and Social Aspects of Biodiversity in Ireland*[8], have increased understanding of the importance of conserving biodiversity for human wellbeing and the economy. This is reflected in national policy objectives for biodiversity and nature conservation, such as the Natural Environment White Paper[9] in England, the White Paper on Natural Resources[10] in Wales, the *Land Use Strategy for Scotland*[11], and the *National Biodiversity Action Plan 2017-2021*[12] in Ireland. EcIA supports implementation of national biodiversity strategies and national planning policies for safeguarding biodiversity and supporting the delivery of sustainable development. In the marine environment this is reflected through UK adoption of the Marine Strategy Framework Directive, a programme of measures designed to achieve or maintain Good Environmental Status in UK seas by 2020[13], the UK Marine Policy Statement[14] and the Integrated Marine Plan for Ireland (2012)[15].

1.3 *EcIA is a process of identifying, quantifying and evaluating the potential effects of development-related or other proposed actions on habitats, species and ecosystems.* EcIA can be used for the appraisal of projects of any scale: it is a systematic and repeatable process applicable to a wide range of projects.

1.4 Two particular uses of EcIA are:

- providing the ecological component of Environmental Impact Assessment (EIA) required under EIA Regulations
- demonstrating how a project accords with relevant planning policy and legislation where an EIA is not required.

1.5 The EcIA process can be fitted seamlessly into the EIA process or it can stand alone. Summary information on EIA is provided in Box 1. It is recommended that the EcIA process is used to present an assessment of the ecological effects of any project which could affect biodiversity.

Box 1: Environmental Impact Assessment

EIAs are carried out to meet the requirements of Council Directive 85/337/EEC on the assessment of the effects of certain public and private projects on the environment, as amended by Council Directives 97/11/EC, 2003/35/EC and 2009/31/EC and redrafted in a codified version Directive 2011/92/EU. The amended Environmental Impact Assessment (EIA) Directive 2014/52/EU entered into force in 2014 to simplify the rules for assessing the potential effects of projects on the environment and Member States had to apply these rules from May 2017[16].

The Directive requires EIA to be carried out before development consent is granted for projects that are likely to have significant environmental effects. EIA is a mandatory requirement for projects listed in Annex I of the Directive. It is also required for projects that meet the criteria for Annex II development and are likely to have significant environmental effects (as defined in Annex III of the Directive). EIAs should provide a comprehensive understanding of the implications of a project proposal, including consideration of impacts on biodiversity, and interactions with soil, water and air.

The main statutory instruments that implement the Directive in the UK (updated in 2017) are available on the website for UK legislation[17]. In the Republic of Ireland, the EIA Directive was transposed in planning legislation in 2000 and given further effect in 2013[18].

1.6 Work undertaken for EcIA can inform Habitats Regulations Assessments (HRA), the Appropriate Assessment process in Ireland and Water Framework Directive Assessments. These Guidelines do not cover these Assessments, but a summary is provided in Box 2.

Box 2: Habitats Regulations Assessment, Appropriate Assessment in Ireland and Water Framework Directive Assessment

Projects affecting designated sites protected by the Habitats Directive[19] (transposed into national Regulations[20]) will require specific assessments in accordance with the Directive. Similarly, projects affecting water bodies may require assessment under the Water Framework Directive[21]. These Guidelines do not explain the specific assessment processes to be applied or the criteria governing decisions. Guidance on implementing the Habitats Directive is provided by the European Commission in *Managing Natura 2000 sites the provisions of Article 6 of the 'Habitats' Directive 92/43/EEC*[22] and in more detail in The Habitats Regulations Assessment Handbook[23] and in Appropriate Assessment of Plans and *Projects in Ireland: Guidance for Planning Authoritie*[24]. Information on the Water Framework Directive is available on the Joint Nature Conservation Committee website[25] and on the Irish Water Framework Directive website[26].

Information assembled for an EcIA that is relevant to subsequent Habitats Regulations Assessment (HRA) and/or Water Framework Directive assessments should be presented in a format that can be readily extracted for these other assessments.

Use of the Guidelines

1.7 These Guidelines should be followed by ecologists undertaking EcIA. The Guidelines also provide regulators, decision-makers and those submitting projects with an indication of the information needed to adequately consider projects in the light of biodiversity legislation and policy.

1.8 These Guidelines are applicable to ecologists acting for:

- a project proposer such as a developer submitting a planning application
- a competent authority making the decision about consent for a proposed project
- public bodies with biodiversity and landscape duties and/or Water Framework Directive duties / Marine Strategy Framework Directive duties
- consultees such as those who advise the competent authority in a statutory or voluntary capacity.

Differing Scales of EcIA and a Proportionate Approach

1.9 EcIA can be applied to projects of widely varying scales. The EcIA principles and process outlined in this guidance are relevant to all developments that may impact on ecological features – this term is used throughout to cover habitats, species and ecosystems. However, the level of detail required in an EcIA will inevitably be proportionate to the scale of the development and complexity of its potential impacts. These Guidelines do not prescribe exactly how to undertake an EcIA, but provide guidance to practitioners for refining their own methodologies.

1.10 Scoping (Chapter 2) should be proportionate to potential effects on ecological features. Professional ecologists need to use their knowledge and experience to judge the resources required to complete an adequate and effective EcIA.

1.11 Emphasis in EcIA is on 'significant effects' (see Box 3) rather than all ecological effects. Relevant legislation, regulations, plans and policies should be considered at an early stage, as these will have a bearing on the scope of investigations, how potential effects are interpreted, and the criteria needed for determining significance.

Box 3: Significant effects

Significance is a concept related to the weight that should be attached to effects when decisions are made. For the purpose of EcIA, 'significant effect' is an effect that either supports or undermines biodiversity conservation objectives for 'important ecological features' (explained in Chapter 4) or for biodiversity in general. Conservation objectives may be specific (e.g. for a designated site) or broad (e.g. national/local nature conservation policy) or more wide-ranging (enhancement of biodiversity). Effects can be considered significant at a wide range of scales from international to local.

A significant effect is an effect that is sufficiently important to require assessment and reporting so that the decision maker is adequately informed of the environmental consequences of permitting a project.

In broad terms, significant effects encompass impacts on structure and function of defined sites, habitats or ecosystems and the conservation status of habitats and species (including extent, abundance and distribution).

See paragraphs 5.24 – 5.40 for further explanation of significant effects.

A Rigorous and Transparent Approach

1.12 A scientifically rigorous and transparent approach to EcIA is essential. EcIA should be undertaken by qualified professionals with an appropriate level of experience in ecological survey and impact assessment who are recognised by a relevant professional body such as CIEEM.

1.13 All interested parties should understand the assessment process and who is responsible for implementing and monitoring the actions needed to deliver biodiversity objectives. The EcIA must provide reliable and defensible information about, and interpretation of, the likely significant ecological effects from inception to operation, maintenance and, where appropriate, closure and decommissioning.

1.14 Account needs to be taken of existing information and understanding, in conjunction with the results of EcIAs undertaken elsewhere. CIEEM encourages all practitioners to share data and results, for example through Local Record Centres (LRCs) in Britain[27], the Centre for Environmental Data and Recording (CEDaR) in Northern Ireland[28], the National Biodiversity Data Centre in Ireland[29] and the National Biodiversity Network Atlas Scotland[30]. Consideration should also be given to the publication of findings to allow review and learning by others, for example the Marine Data Exchange.[31] Guidelines for accessing and using biodiversity data, including the submission of data, have been produced by CIEEM (2016)[32].

1.15 The EcIA should consider the significant ecological effects of a project in the light of relevant planning policies and legislation. Legislation relating to terrestrial, freshwater, coastal and marine environments is evolving and practitioners should always check for changes and revisions. These Guidelines are based on requirements at the time of publication and changes in legislation and policy may necessitate periodic review. The Guidelines do not attempt to explain legislative detail, and users should refer to relevant legislation and case law or seek specialist legal advice.

1.16 EcIA benefits from early consultation with the relevant competent authority, Statutory Nature Conservation Bodies (SNCBs), Environment(al) Protection Agencies (EPA) and Non-Governmental Organisations (NGOs). Through EcIA the developer/project proposer can be made fully aware of matters such as site designations, protected habitats and protected species, and their implications, before pursuing a project. Engagement with consultees on a regular basis will help refinement of the proposal, smooth progression through the planning process and minimise misunderstanding and controversy.

1.17 There will be examples on the coast where a project will be subject to both marine and terrestrial consent processes. Early consultation provides an opportunity to agree the scope of the assessment and approach for the assessment process in these circumstances. In England a Coastal Concordat has been published which promotes co-ordination between regulatory authorities responsible for the range of consents, permissions and licences, and the provision of a single point of entry into the regulatory system for applicants[33].

1.18 Good communication is essential between ecologists and other professionals engaged in the assessment process (e.g. geomorphologists, hydrologists, social practitioners, EIA coordinators), together with proponents, to help inform judgements and refine proposals. It may also require engagement with comparable international bodies where trans-boundary effects are predicted e.g. in the marine environment.

Key Principles

1.19 The following principles[34] underpin EcIA:

Avoidance	Seek options that avoid harm to ecological features (for example, by locating on an alternative site).
Mitigation	Negative effects should be avoided or minimised through mitigation measures, either through the design of the project or subsequent measures that can be guaranteed – for example, through a condition or planning obligation.
Compensation	Where there are significant residual negative ecological effects despite the mitigation proposed, these should be offset by appropriate compensatory measures.
Enhancement	Seek to provide net benefits for biodiversity over and above requirements for avoidance, mitigation or compensation.

The EcIA Process

1.20 The EcIA process is summarised in Box 4. EcIA is an iterative process; for example, scoping is an ongoing process - the initial proposed scope of the EcIA may be modified following further ecological survey/research and during impact assessment.

Box 4: Summary of the EcIA process

Initial project design

At the outset of the project, the proponent's ecologist(s) should:

- obtain information on the project, any alternatives that have been studied and existing ecological information
- undertake a gap analysis of known and needed information and plan and prioritise gap filling
- review ecological implications of alternatives
- discuss key ecological considerations about the project design (and alternatives) with the project proposer and the design team (e.g. engineers, architects)
- recommend modifications to the design to avoid negative ecological impacts or, where this is not possible, to reduce them
- explore opportunities for ecological enhancements and net gain of biodiversity as early as possible

Screening (EIA only)

The project proposer may seek a formal screening opinion from the competent authority to determine the need for EIA under the EIA Regulations.

Scoping EcIA

Scoping determines the issues to be covered by the EcIA. Where an EIA is required, the competent authority must provide a 'scoping opinion' if requested by the developer. In all other cases, it is advisable to seek the views of competent authorities and key consultees on the proposed scope of the EcIA.
In all cases, scoping will need to:

- identify any potential licensing requirements for survey and/or development regarding legally protected species
- identify all proposed construction, operating, maintenance, closure and decommissioning activities that may generate significant ecological effects
- identify significant other developments that may give rise to cumulative effects
- collect initial baseline information, such as through a Preliminary Ecological Appraisal (PEA), to enable identification of potentially important ecological features within the zone of influence of the project
- identify for assessment those important ecological features that could sustain significant positive or negative impacts, as far as possible given the information available (and employing the precautionary principle)
- identify relationships with other environmental aspects e.g. water, landscapes
- identify data gaps
- propose suitable spatial and temporal scopes for the assessment and identify the main ecological issues to be addressed
- undertake preliminary assessment of potential ecological impacts on identified features, incorporating existing data/information
- reconsider spatial and temporal scope and amend the extent of preliminary investigations if necessary
- list those features that do not need further assessment, with appropriate justification
- identify suitable survey/research methodologies that (ideally) have been agreed with consultees
- confirm potential opportunities for avoidance of impacts, mitigation, ecological enhancement and biodiversity net gain
- ensure biodiversity data collected is suitable for potential use in biodiversity metrics for assessment of 'net gain' of biodiversity
- ensure compliance with standards and consistency with formal methods of evaluation.

For EIA projects, and as good practice for non-EIA projects, scoping should also:

- involve appropriate consultation with the competent authorities, statutory agencies, other regulatory bodies, and possibly relevant NGOs and other non-statutory consultees, regarding the project and the proposed scope of the assessment
- produce a scoping report that can be circulated for comment and modified accordingly.

Impact assessment

The EcIA team will be involved in the following assessment process, which should cover all phases of any project:

- determine the importance of ecological features affected, through survey and/or research and with reference to available contextual information
- assess impacts potentially affecting important features
- characterise the impacts, e.g. extent, magnitude, duration, reversibility, timing and frequency
- identify cumulative impacts
- identify significant effects of impacts in the absence of any mitigation.

The surveys and research that are undertaken may indicate that the scope of the assessment should be adjusted and further studies carried out.

Evolution of project design and mitigation

- consider alternative location(s) or layouts for the proposed development
- identify mitigation measures and explain their likely success
- identify opportunities for ecological enhancement and net gain of biodiversity

- design and agree monitoring strategy and monitoring of mitigation performance with the competent authority (and, in some cases, consultees)
- provide sufficient information for mitigation measures to be implemented effectively, e.g. through an Environmental Management Plan (EMP).

Identify significant residual effects and their legal, policy and development management consequences

- produce a clear summary of the residual impacts and the significance of their effects following incorporation of avoidance and mitigation measures
- consider the implications of significant effects on the important ecological features in accordance with planning policies and legislation
- where significant negative effects cannot be avoided or mitigated, identify compensation measures to be implemented
- include mitigation, compensation and enhancement measures in the EMP or similar
- make an assessment of the significance of any cumulative effects.

Reporting

The final EcIA report (or for EIAs, the Environmental (Impact) Statement) should clearly set out all the ecological information necessary for a robust decision to be made. Key aspects include a description of the following:

- ecological baseline and trends if the project were not to go ahead, including the survey data used to inform the baseline
- criteria used to evaluate ecological features
- criteria used to assess the significance of effects arising from the impacts of the project
- justification of methods used
- the identification of likely impacts (positive and negative) on ecological features together with an explanation of the significance of the overall effects for each important ecological feature
- mitigation, compensation and enhancement measures
- legal and policy consequences
- identification of any limitations to the assessment, or the surveys which underpin it, and an explanation of the implications
- a presentation of any analytical techniques used and the analysis itself.

The report should also set out the ecological monitoring required to:

- confirm the implementation of conditions/planning agreements
- audit predicted impacts against the actual situation
- take measures to rectify unexpected negative impacts and ineffective mitigation, compensation and enhancement measures.

EcIA reports

1.21 EcIA reports should be tailored to suit individual circumstances and different formats are acceptable. However, CIEEM considers it important that the structure and content of EcIA reports are standardised. A logical structure for a report is provided in *CIEEM Guidelines for Ecological Report Writing*[35] and is reproduced in Appendix 3. Where an EIA is required, the Ecological Impact Assessment will be presented in a way that fits the overall style and structure of the Environmental (Impact) Statement. However, the content of Appendix 3 remains relevant. Where elements of this content lie outside the presentation of the main Ecological Impact Assessment (usually an ecological chapter of the EIA), cross-reference should be included.

Note: The following definitions are used for the terms 'impact' and 'effect':

Impact – Actions resulting in changes to an ecological feature. For example, the construction activities of a development removing a hedgerow.

Effect – Outcome to an ecological feature from an impact. For example, the effects on a dormouse population from loss of a hedgerow.

2 SCOPING

Purpose and Objectives of Scoping

2.1 Scoping is the process of determining the ecological issues to be addressed in the EcIA. It sets out the methods and resources to be used and establishes the spatial and temporal limits for surveys and assessments.

2.2 Scoping is essential to:

- establish an initial understanding of the baseline ecological conditions and the potential significant effects that could arise (see 5.24)
- determine and agree the zone of influence of the project and which important ecological features could be significantly affected
- determine and agree the proposed surveys and methods for survey, evaluation and assessment
- determine and agree the content of the EcIA.

2.3 Scoping ensures that the project proposer is aware of the matters that need to be considered, and the likely costs and timeframes associated with the EcIA. Scoping requires collation of any pre-existing and/or relevant background information and the use of professional judgement to determine the sites, species, ecosystems and habitats that are likely to require assessment.

2.4 The timing of scoping is very important. It should begin at the earliest opportunity to ensure sufficient time is allowed to adequately inform the EcIA process. Early scoping will also allow for effective consultation and any adjustment to the scope of the assessment if necessary. It will also enable early identification of potential impacts and the opportunity to refine the proposal in response. Some of the benefits of scoping are outlined in Box 5.

Box 5: The benefits of scoping

- early stakeholder engagement and input, identifying issues of concern
- early identification of possible changes to scheme location and design needed to avoid or reduce significant ecological effects
- a proportionate assessment focused on significant effects
- clear terms of reference for all engaged in the EcIA, including an understanding of the criteria that will be used to evaluate the significance of findings
- early identification of existing data and data gaps, and how these will be addressed
- justification for the exclusion of potential impacts on ecological features from the EcIA where appropriate
- identification of the fieldwork required, methods to be used and timescales required including timings for seasonally dependent surveys
- identification of the data needed from other members of the assessment team, such as noise or traffic data.

2.5 National, regional and local policies expect projects to deliver biodiversity benefits, not simply no net loss through avoiding or mitigating negative effects. For example, the England National Planning Policy Framework (2018)[36] states that the planning system should minimise impacts on and provide net gains for biodiversity. Scoping provides an early opportunity for ecologists to work with others to achieve national and local policy objectives and lays the foundation for the whole consultation and assessment process.

Initial and ongoing scoping

2.6 Where an EcIA is carried out as part of an EIA under the amended EIA Directive 2014/52/E[37], competent authorities are required to provide a 'scoping opinion' if requested by a developer. A scoping opinion summarises the specific advice of the competent authority concerning the required coverage and content of the EIA. Although not a legal requirement, a scoping opinion can help to avoid problems by ensuring consensus on the scope of the assessment.

2.7 Where EcIA is not part of an EIA, it is also advisable to seek the views of the competent authority and key consultees on the proposed scope of the EcIA. Published documents such as statutory agencies' standing advice and use of a PEA can also assist the scoping of the EcIA (see Box 6).

Box 6: Preliminary Ecological Appraisal

Preliminary Ecological Appraisal[38] (PEA) is the term used to describe a rapid assessment of the ecological features present, or potentially present, within a site or the surrounding area (within the Zone of Influence for a proposed project). It normally comprises a desk study and a walkover survey.

A PEA can be undertaken in a variety of contexts, often as a preliminary assessment of likely impacts of a development scheme. It can help the project proposer and planning authority to agree the appropriate scope of any subsequent impact assessment or determine that ecological issues will not be significant in determining the application.

The results of the PEA can be provided in a PEA report or simply incorporated into the EcIA report, ecology component of an EIA, or a scoping report, as needed.

A PEA report does not replace an EcIA, as it normally contains recommendations for further surveys or general design advice to a developer, rather than a detailed assessment of the effects of a finalised scheme, with all required ecological surveys completed. For very straightforward projects, where no further ecological surveys are needed, an EcIA Report can be produced following completion of the PEA.

2.8 The results of scoping can be presented as a formal report and/or letter to the competent authority. This is strongly recommended for any project that requires detailed ecological survey, and particularly where it is important to get stakeholder agreement on the terms of reference for the EcIA. For EcIAs that are part of EIAs, a scoping report/letter can be used as the basis for applying for a formal scoping opinion from the competent authority.

2.9 This initial scoping (and any scoping opinion) represents the proposed scope at a specific moment in time. However, the process of scoping is iterative and may continue throughout the early stages of a project. The proposed scope of an EcIA may change following the preparation of a scoping report/letter/initial consultation. This may be in response to concerns identified by statutory or other consultees, changes in the project design, or availability of environmental information. It is good practice to record the final scope of the assessment within the EcIA report or, when in relation to an EIA, in the Environmental (Impact) Statement.

The Scoping Process

Overview

2.10 Scoping should be a flexible, adaptive and iterative process based on consultations, literature searches, site visits and discussions with the wider project team. Box 7 outlines the key activities in the scoping process.

Box 7: Key activities in scoping

- obtain information about the project from the project proposer or their engineers/designers
- identify any particular environmental aims or objectives of the project
- liaise with other environmental specialists to enable consistent assessment across environmental disciplines
- identify stakeholders and establish a consultation strategy
- establish the zone(s) of influence of the proposed activities (area(s) over which ecological features may be affected by the biophysical changes caused by the proposed project and associated activities) or identify the need for modelling to determine the zone(s) of influence (see Box 10) – this can be an iterative process following further research and survey. Zones of influence in the marine environment can be particularly extensive e.g. pollutants can easily be distributed
- carry out a desk study and site visit to assess likely issues and concerns and to identify designated sites, habitats and species populations which may be exposed to change as a result of the proposed activities – this should include the full distribution or extent of any ecological features which overlap with the zone of influence
- consider options with the developer and project team for changes in location, siting, phasing and design where significant effects are likely
- identify data gaps and agree details of proposed survey and research methodologies, including temporal and spatial considerations – note that this does not preclude requests from stakeholders for further information at a later stage of the EcIA. Data on mobile species and site specific data may be particularly lacking in the marine environment.
- identify relevant legislation, regulations, policies and plans and review their requirements
- identify all relevant conservation objectives, including any specific objectives for designated sites
- identify (as far as possible) the need for other relevant consents, in addition to planning permission e.g. European protected species licences or water abstraction licences
- identify information required to determine the baseline ecological conditions, including environmental trends, management activities, completed developments and development for which consent has been or is likely to be granted
- identify the factors likely to affect habitats, species and ecosystems, including the structure and function of relevant ecosystems and habitats and the conservation status of relevant habitats and species
- determine what ecological information is required to support the assessment of ecosystem services (see paragraphs 4.25 and 4.26)
- evaluate experience gained and outcomes of relevant previous projects
- identify other projects/proposals that could result in significant cumulative effects
- identify opportunities for mitigation and enhancement, including protecting and enhancing ecological networks (Chapter 6)
- continue to refine the scope, 'scoping out' (excluding) potential effects that are no longer considered likely to be significant (providing justification) and addressing newly identified effects that are likely to be significant.

Identifying and consulting with stakeholders

2.11 Consideration should be given to the best methods of engaging stakeholders. Where there are potentially significant effects on ecological features of particular value to communities or user groups (e.g anglers), it is important to consult with those communities or groups. In the marine environment, the impact on communities can involve those much further afield than those closest to the proposed development.

2.12 Statutory and non-statutory consultees have an important role in providing site-specific data, contextual information and expertise. Consultation will enable evaluation and agreement of the scope and methods of any investigations, including the period for data collection.

2.13 Preliminary discussions with stakeholders should determine:

- ecological features that could be affected
- appropriate assessment methodologies.

2.14 There should also be discussions as early as possible with key stakeholders regarding:

- potential strategies to avoid or minimise any negative impacts
- potential ways of compensating for any significant negative residual effects (after mitigation)
- objectives for enhancement, including, where appropriate, net gain for biodiversity.

2.15 Where a project does not include a specific consultation stage, it is still important to consult with stakeholders. In some cases, the details of a project will be confidential at the scoping stage, requiring the proponent's ecologist to scope the project without consultation. In such circumstances, a precautionary approach to scoping should be taken and consultation carried out as soon as possible. Initial findings of scoping should be circulated to stakeholders for comment.

Defining the project and project activities

2.16 It is important to consider all development and activity associated with the main proposal to enable assessment of the impacts of the project as a whole. Associated development (such as transmission lines for a power station) may be subject to separate planning applications and consents and needs to be considered along with other relevant projects that may contribute to cumulative effects (see 5.19 - 5.22).

2.17 Gathering accurate information about the project is essential:

- what are the proposed activities during construction, operation, decommissioning/closure?
- where, when, how and for what period of time will they take place?
- what biophysical changes in the environment are likely to occur?
- what are the information gaps, including ecological information and data from other sources, such as traffic, air quality, hydrological or noise data?

Box 8 indicates the information required for effective scoping.

Box 8: Information about the project

Effective scoping in EcIA requires information on:

- location, size, extent and spatial organisation of infrastructure and activities, including ancillary development (both onshore and offshore)
- lifetime of project including decommissioning
- activities likely to cause bio-physical changes during construction, operation and decommissioning, and their timing, frequency, duration, location, extent and magnitude e.g. emissions (type, volume, range), construction activities etc. (Box 9)
- zone(s) of influence of the activities, including activities off site that may be relevant, such as access route construction
- other developments within the zone(s) of influence for which consent has been or is likely to be granted
- pathway for emissions (e.g. water, soil or air) and the receiving environment
- best and worst case operating conditions including construction practices that could affect biodiversity
- proposed measures designed to deliver biodiversity enhancements.

To assess the effects of any alternatives considered, information will be needed on each alternative, for example:

- sites
- designs/layouts
- processes
- timescales
- means of meeting the objectives of the project.

2.18 For projects that require an EIA, reference should be made to the schedules of the relevant EIA Regulations (see Box 1) that specify the type and scale of development requiring EIA and the key issues to consider.

2.19 Box 9 gives examples of activities with potential to generate ecological impacts. It can be difficult at the scoping stage to establish the full extent of likely effects, and a precautionary approach is needed to ensure that the study area incorporates all areas where significant effects could occur throughout the life of the project.

Box 9: Examples of activities that can generate ecological impacts

Preliminary activities prior to the main construction contract

- ground and seabed investigations e.g. for contaminated land/seabed, drilling of wells, boreholes, geological sampling, groundwater sampling, seabed sediment analysis, gas monitoring/detection
- acoustic mapping/profiling of the seabed e.g. via sonar or shallow seismics
- vegetation clearance
- demolition operations
- archaeological excavation.

Construction phase

- access and travel on/off-site, including temporary access routes for construction vehicles and vessels
- areas for plant maintenance and for storage of oils, fuels and chemicals
- movement of materials to/from or within a site
- demolition operations
- acoustic disturbance and vibration from construction activities, particularly in the marine environment due to rapid and extensive transmission of sound underwater
- assembly areas for components of construction
- aggregate clearance, including blasting
- dewatering or drawdown e.g. for reservoir safety works, mining
- ground excavation, infilling and landscaping
- drainage or deposition of material on wetland and infilling of ponds
- temporary diversion of water courses, water abstraction, discharge to a water body
- managed realignment of coastal habitats
- navigation channels and dredging
- drilling operations
- disposal of dredged materials/drilling waste
- use of explosives in the marine environment
- seabed seismic and excavation works
- removal or disturbance of sediments or disruption of sediment transport
- release of contaminants from disturbed sediment
- seabed and water column disturbance
- dust generation
- on-site borrow pits
- soil stripping
- environmental incidents and accidents e.g. spillages, noise and emissions
- burning of waste
- lighting
- anchoring and mooring
- provision of services and utilities e.g. underground power lines, water supply and drainage
- infrastructure links between an offshore location and terrestrial networks e.g. cables and pipelines
- setup and subsequent removal of site offices/compounds and final site clearance after construction
- construction of structures and hard surfaces
- storage areas for construction / excavated materials
- structural works for new building and engineering
- structural works to existing buildings, including conversions
- vegetation/habitat clearance including tree felling and use of herbicide.

Occupation/operational phase

- access to site (both route and means)
- drainage
- implementation of landscape design and habitat management (type and location)
- presence of people, vehicles and their activities e.g. increased public access and recreational pressure, risk of fires
- lighting
- physical presence of structures e.g. a new road or a wind turbine
- presence of pets
- site operation and management e.g. maintenance operations, industrial processes generating emissions, lighting, noise, water abstraction and discharge, operation of wind/hydro turbines, drilling, water level changes, use of a road by traffic etc.
- maintenance dredging, on-going scour protection, sediment management etc.
- runoff containing contaminants or sediments
- alteration to hydrodynamics and sediment transport e.g. wave action/currents.

Decommissioning phase

- blasting
- water management pumps, mine shafts
- disturbance or removal of waste and contaminated water, soil or sediment
- changes in wave action, sediments and hydrodynamics
- removal or demolition of disused structures that may damage habitat or have been colonised e.g. roosting bats, barn owls
- removal of ancillary developments including culverts
- removal or neglect of structures which might cause pollution
- recycling of material and re-use and disposal.

Restoration phase

- restoration activities where operations/phases have finished e.g. for mineral extractions.

Potential non-standard operations

- one-off incidents and accidents (including fuel leaks, oil and chemical spills, vandalism, erosion and sediment run-off)
- military testing

Note that some developments, such as quarrying, will operate in continuous phases of construction, operation and restoration. Mitigation works may also be damaged by one-off incidents such as accidents or vandalism.

Adapted from: *Developing Naturally. A handbook for incorporating the natural environment into planning and development*[39]

Establishing zone(s) of influence

2.20 The 'zone of influence' for a project is the area over which ecological features may be affected by biophysical changes as a result of the proposed project and associated activities. This is likely to extend beyond the project site, for example where there are ecological or hydrological links beyond the site boundaries. In the marine environment, zones of influence can be extensive e.g. pollution and materials can easily be transported elsewhere, currents and waves can be altered causing effects well beyond the site and effects on mobile species may be manifest elsewhere. Activities associated with the construction, operation (best and worst-case operating conditions), decommissioning and restoration phases should be separately identified. The location and distribution of activities are best shown on geo-referenced maps, plans or charts for overlaying onto maps of ecological features.

2.21 The zone of influence will vary for different ecological features depending on their sensitivity to an environmental change. It may therefore be appropriate to identify different zones of influence for different features. The features affected could include habitats, species, and ecosystems and the processes on which they depend. Box 10 provides the key considerations in establishing the zone(s) of influence.

Box 10: Ecological considerations for establishing the zone(s) of influence

The following questions will help to determine the zone(s) of influence on ecological features:

- What 'important' ecological features (see Chapter 4) are known to occur within the project site and the surrounding area?
- What other 'important' ecological features could occur within the project site and surrounding area based on knowledge of the local distribution of relevant habitats and species?
- What activities may generate ecological impacts and which of these might have an influence on ecological features beyond the site boundaries? (see Box 9)
- Is the project likely to affect migratory species?
- Is the area used by mobile species that make regular movements to, from, or across the site?
- What are the key ecological processes or species activity periods? Are there seasonal variations in distribution, abundance and activity?
- What are the key hydrodynamic processes at the site (e.g. tidal currents, wave activity)? Are there seasonal or cyclic variations in these?
- Does the project affect any sites, directly or indirectly, that are designated or likely to be designated in the foreseeable future? What are the reasons for designation?
- What is required for the maintenance of particular ecosystems, networks, habitats or species populations? How would these be affected by project activities?
    - What are their distribution and status elsewhere for comparison?
    - What were their historical distributions, status and management compared with present?
    - Is anything known about the key factors influencing distribution and abundance of the feature(s)?
    - What are their scales of variation, vulnerability and likely exposure to the project?
- Are there any features whose disappearance would have significant consequences for other features?
- Are there any other projects planned within the same area or time-frame that may contribute to cumulative effects? (see 5.19 - 5.22)

2.22 Box 11 provides examples of how the zones of influence for a proposed quarry, an offshore wind farm and a port development have been determined.

Box 11: Examples of defining the zones of influence

Quarry

- All ecological features occurring within the area to be worked will be affected by changes in land cover caused by topsoil stripping and excavation.
- Blasting, noise, dust and changes in human activity will also affect species in adjacent habitats.
- If the quarry involves major, long-term dewatering operations, there could be consequences for water-dependent habitats and species that are many miles from the quarry. It may not be possible to determine the zone of influence of dewatering without undertaking hydrological/hydrogeological (cone of depression) modelling. The zone of influence should include all water-dependent features that could be significantly affected by the predicted draw-down, providing they are of sufficient importance to be considered in the assessment.
- If the quarry requires new infrastructure (e.g. roads, power supply or waste water disposal) there could be significant consequences for ecological features beyond the boundaries of the site in addition to those affected by dewatering.
- If the project could affect the breeding territory of a sub-population of a bird species, it would be necessary to consider the implications of localised effects in relation to the birds' wider population. If there were a number of sub-populations in the area, then it might be appropriate to consider the zone of influence to only include the specific sub-population of birds affected. However, if the birds were at the edge of their range, or the sub-population affected was an important link in the distribution pattern, then it might be necessary to consider implications for the zone of influence to include the regional, or even the national population.

Offshore wind farm

The construction of a wind farm may have a variety of local effects such as scour around the foundations, but defining the zones of influence of the project also needs to take account of the potential for more widespread impacts, such as:

- changes to sediment movement and potentially to coastal morphology depending upon proximity to the shore and the method of protecting transmission cables;
- direct construction impacts e.g. direct removal of benthic biodiversity;
- damage to spawning grounds within and adjacent to the infrastructure, through vibration and noise disturbance;
- acoustic impact of piling on marine mammals, which may cause disturbance, displacement and injury;
- obstruction of migration routes of mobile species, especially fish, birds and marine mammals;
- impacts on seabird populations and on the dynamics of seabird colonies, e.g. displacement of birds from foraging or loafing areas and collision risk with turbines;
- impacts on feeding resources and breeding areas for seabirds, fish and marine mammals;
- impacts of vibrations/electromagnetic interference on fish, birds and marine mammals;
- disturbance to coastal vegetation and ecological features resulting from requirements for additional infrastructure and land-links, (e.g. piers and jetties) together with possible needs for safeguarding their integrity (e.g. armouring a cable); and
- provision of substrate for colonisation by native or non-native species.

Port development

The construction of a new port will not only involve new infrastructure, direct habitat losses and displacement of waterfowl, but also more widespread impacts that need to be taken into consideration when determining the project's zones of influence, such as dredged channels, which may impact on subtidal species or assemblages.

The impacts of these changes largely relate to the physical processes within the water body or sediment cell, although these activities may have consequences for the benthic assemblage and some mobile species of the area, particularly in non-developed areas.

These may include:

- disruption to sediment pathways;
- changes to tidal propagation and range affecting the extent and duration of mudflat and saltmarsh exposure;
- changes in water quality with increased turbidity;
- potential release of contaminants in the seabed that may be transported elsewhere by the currents;
- changed wave regimes;
- changes in the local pattern of currents, tidal energy and sediment dynamics;
- changes to accretion and erosion processes at localities away from the main point of impact that change the functionality of mudflat, saltmarsh and sub-tidal communities;
- long-term changes in sedimentation and sediment availability;
- acoustic impact on marine mammals;
- introduction/spread of marine invasive non-native species.

2.23 Study boundaries should be drawn to include areas within the zone(s) of influence however remote from the project site. The results of professionally accredited or published scientific studies should be used, where available, to establish the spatial and temporal limits of the biophysical changes likely to be caused by specific activities and to justify decisions about the zone of influence. For example, the Somerset 'Econet' project[40] has defined 'effect distances' for use in EcIA based on home ranges and vulnerability to different activities e.g. disturbance to breeding birds caused by road traffic[41]. Statutory organisations may also specify impact zones in standing advice or guidance documents e.g. Natural England's SSSI Impact Risk Zones[42] and the NPWS likely zones of impact as discussed in Guidance for Planning Authorities[43]. Ecological modelling may be required e.g. mixing zones and hydrodynamic assessments in the marine environment. Indirect effects should also be taken into account (e.g. the effects of displaced individuals on other populations). Defining study boundaries will rely on the professional judgment of an ecologist. Assumptions based on studies should be recorded.

2.24 The zone of influence should be regularly reviewed and amended as the project evolves. If inadequate information is available to properly define the zone of influence, this should be acknowledged and a precautionary approach adopted.

Transboundary effects

2.25 Projects may affect ecological features over several administrative areas. Impact assessments should cover the zone of influence regardless of administrative boundaries and information on transboundary effects should be notified to the relevant authorities to enable them to take appropriate action.

Selecting ecological features for detailed assessment

2.26 Once the likely impacts have been identified, it is necessary to undertake a systematic assessment of important ecological features (Chapter 4) that could be significantly affected (including negative and positive effects). This is consistent with EIA Regulations which only require investigation of likely significant effects. Determining the significance of effects is explained in Chapter 5. To ensure clarity, the rationale and criteria used to select, or exclude, certain features for detailed assessment should be agreed with relevant stakeholders and documented during scoping.

2.27 In some cases the data collected as part of the scoping process will be sufficient to inform the assessment of effects on a given feature. In other cases, additional surveys will need to be undertaken.

2.28 Ecologists undertaking EcIAs should determine whether an ecological feature within the zone of influence of a development should be 'scoped out' (excluded) and justify the reasons for doing so. Features can be scoped out of the assessment at this stage because they are not important enough to warrant further consideration (see Chapter 4) or because they will not be significantly affected. Where impacts on a feature are uncertain the feature should be 'scoped-in' (included) for more detailed assessment.

Conclusions of the Scoping Process

2.29 The outcomes of the scoping process should be:

- a description of the zone(s) of influence of the project
- the identification of key ecological impacts which could be addressed through changes to project design, including consideration of alternatives
- a list of the ecological features to be given detailed consideration in the EcIA and, in some cases, the specific impacts that will be considered in relation to each feature
- a description of the surveys to be undertaken to provide the necessary data to inform the assessment, including methods and timing
- a list of relevant ecological features that will not be given detailed consideration in the EcIA and a justification for their exclusion.

3 ESTABLISHING THE BASELINE

Introduction

3.1 Ecological baseline conditions are those which exist in the absence of proposed activities. The impact assessment determines how the conditions will change in relation to this baseline to facilitate a clear understanding of the effects of a project.

3.2 The conditions that define the baseline need to be carefully considered. This is because the baseline at the time when the project proceeds may differ from conditions that exist at the time an assessment is made. Assessing the impacts of any project and associated activities requires an understanding of the baseline conditions prior to and at the time of the project proceeding or specific activities taking place. If there is likely to be a lengthy time between undertaking an impact assessment (for example, to inform the planning application) and project inception, potential changes in the ecological baseline during that time should be identified.

3.3 It is the predicted baseline conditions at the time the project will be implemented that dictates the baseline against which the impact of the proposal should be assessed. The rationale and assumptions used in predicting the baseline will need to be set out with supporting evidence. Box 12 provides an example of predicting a future baseline scenario.

Box 12: Establishing the baseline: an example

A power station that draws cooling water from a river is to close down due to a rationalisation of the power supply network. During the many years that the power station has been in use, the riverine invertebrate, fish and bird assemblages in the immediate vicinity have adapted to reflect local, increased temperatures caused by the regular discharge of heated river water. Closure of the power station will mean that this discharge will stop. Once closed, it is proposed to convert the power station to residential units. The EcIA for the residential development is being undertaken prior to closing down the power station.

In this instance, the baseline for the EcIA is the predicted post-closure situation, rather than that evident at the time of undertaking the EcIA. The surveys and investigations to describe the baseline must be designed to predict the likely post-closure situation as accurately as possible.

3.4 Examples of factors that should be used to identify potential changes in baseline conditions include:

- trends in species population and distribution
- rates of potential colonisation by new species and habitats
- ecological processes, such as succession
- physical processes – e.g. currents, disruption of sediment pathways
- likely changes in agricultural practice, including agri-environment schemes
- expected outcomes from current and predicted management practices
- trends in habitat quality e.g. resulting from pollution or pollution control
- environmental trends e.g. climate change
- management plans and conservation objectives for designated sites
- the effects of other projects (see 3.8 and Box 13).

3.5 Any EcIA therefore requires the identification of the likely baseline conditions at some point in the future, based on data collected in the past. In the majority of cases, ecological data are likely to have been collected within one or two years prior to an EcIA being written and development activities may take place one or two years after. In these cases the survey data may represent a reliable indication of the baseline conditions. However, in other cases the identification of the baseline based on survey data will be more difficult, for example:

- where the feature is dynamic (such as sand dunes) or changing in response to predictable activities such as habitat management, or
- where there is a considerable time-lag between the date the assessment is undertaken and the date when activities are likely to take place e.g. for multi-phase developments or projects where activity will occur well into the future.

3.6 In such cases it will be important to establish trends based on historical desk study information or field survey over more than one season. It is important to acknowledge any such limitations and uncertainties rather than report them as fact.

3.7 The baseline conditions for each ecological feature should be described clearly, objectively and succinctly within the EcIA, using figures and plans where necessary. Where an extensive amount of survey data has been generated, this can be provided as appendices.

Considering Other Development Projects when Predicting the Baseline

3.8 In some cases, other development projects (besides the one being assessed) can influence the baseline and need to be taken into account. This will be the case in circumstances where another development has been consented or recently constructed and is predicted to have an impact on an ecological feature being considered as part of the EcIA. The baseline may also be affected where another development has an ongoing incremental 'operational' phase effect. An example of this is given in Box 13. Impacts arising from other developments will, in some cases, need to be considered as cumulative impacts. Information on cumulative impact assessment is given in paragraphs 5.19 to 5.22.

Box 13: Establishing the baseline: consideration of other development projects

The scenario

An EIA is being carried out for a proposed wind farm in the uplands. The proposal includes 20 turbines and associated permanent infrastructure, and a temporary works area during construction. The wind farm adjoins a nationally designated site for nature conservation. Construction of another wind farm within the same range of hills is already underway.

Predicting the baseline

The approach to establishing the baseline should be agreed after discussion between the competent authority, the statutory nature conservation organisation and any other relevant agencies. It is likely to include consideration of:

- ecological and other trends affecting the baseline condition of upland habitats and their bird populations e.g. grazing pressure, afforestation, peat extraction, climate change, anticipated changes in the level of disturbance caused by the public
- predicted impacts arising from the wind farm under construction, as reported in the Environmental (Impact) Statement
- predicted (but yet to occur) impacts of other completed, in-construction and consented projects e.g. the operational impacts of other wind farms elsewhere in the uplands.

Informing the Baseline

3.9 During scoping, spatial and temporal limits need to be established for obtaining the necessary baseline information and a clear rationale presented. Variation in populations, habitats or ecosystems over time in the absence of the project should always be considered. This may require more than one year or one season of data to give an accurate reflection of the situation. In many cases this may be determined from historical information, knowledge of general trends and management activities, and an understanding of how each feature/resource might respond.

3.10 The spatial and temporal extent of the baseline should also be informed by the potential for cumulative effects, as well as the need for information to support design of suitable mitigation and compensation measures.

3.11 The spatial extent of baseline studies should be flexible to accommodate different needs. For example, impacts on part of an ecosystem, habitat or population may have implications for the whole ecosystem, habitat or population so that a larger study area may be needed. Vulnerability of different habitats and species may vary greatly depending on the type of project (see 'zone of influence', paragraphs 2.20 to 2.24).

Data

3.12 Data used to establish baseline conditions can be obtained from a range of sources, including desk study and surveys. These surveys may have been carried out during scoping, or scoping may have identified the need for further baseline survey to address gaps. In particular, baseline data for species and habitats may not be available in some marine areas. Standard survey methods should be used to ensure that the data collected are robust and results can be easily interpreted and compared with those from other investigations. Habitat surveys should follow a published and recognised habitat classification system that is appropriate for the site's location (see Appendix 5). Details of how methods have been tailored to meet the needs of the study should be included. If survey methods vary from accepted good practice this should be explained and justified, and reliability of the results discussed.

3.13 Any limitations of surveys, such as information, access or seasonal constraints, should be outlined (see BS 42020[44], clause 6.7). However, these limitations should be avoided wherever possible, for example by undertaking additional surveys. All surveys should be carried out by suitably skilled and experienced staff. Certain protected species surveys must be carried out under the appropriate licence. If surveys are undertaken out of the optimal survey season, or there are other substantive limitations to the data collected, further information may be needed to ensure that the EcIA is robust.

3.14 If it is not feasible to gain access to land beyond the project site, it may be possible to undertake a basic survey from public highways or other accessible public spaces[45]. The considerable limitations of this type of survey and the influence on confidence in the conclusions should be assessed and reported. Where feasible, survey limitations should be addressed: for example, if access to private land can be gained at a later date, survey findings should be updated.

3.15 Desk study information can be obtained from a range of sources, including the local environmental records centre, local nature conservation groups and individuals, previous survey reports for the site or other sites in the surrounding area, and various web-based sources[46]. Aerial photographs or other remote sensing data such as satellite images, Lidar data and hydrographic data can provide insight into spatial and temporal relationships.

4 IMPORTANT ECOLOGICAL FEATURES

Introduction

4.1 One of the key challenges in EcIA is to decide which ecological features (habitats, species, ecosystem and their functions/processes) are important and should be subject to detailed assessment. Such ecological features will be those that are considered to be important and potentially affected by the project. It is not necessary to carry out detailed assessment of features that are sufficiently widespread, unthreatened and resilient to project impacts and will remain viable and sustainable. However, efforts should still be made to safeguard biodiversity in its entirety, as emphasised by the Convention on Biological Diversity[47] and developed in the EU Biodiversity Strategy 2020[48]. The EU Strategy and national policy documents emphasise the need to achieve no net loss of biodiversity and enhancement of biodiversity.

4.2 Ecological features can be important for a variety of reasons and the rationale used should be explained to demonstrate a robust selection process. Importance may relate, for example, to the quality or extent of designated sites or habitats, to habitat/species rarity, to the extent to which they are threatened throughout their range, or to their rate of decline.

Determining Importance

4.3 The EcIA should demonstrate how a proposal will comply with statutory requirements and policy objectives for biodiversity. European, national and local governments and specialist organisations have identified a large number of sites, habitats and species that provide the key focus for biodiversity conservation in the UK and Ireland, supported by policy and legislation. These provide an objective starting point for identifying the important ecological features that need to be considered in EcIA (Box 14).

Box 14: Key sites, habitats and species for biodiversity and nature conservation in the UK and Ireland

Designated Sites

- Statutory sites designated or classified under international conventions or European legislation, for example
    - World Heritage Sites, Biosphere Reserves, Wetlands of International Importance (Ramsar sites), Special Areas of Conservation, Special Protection Areas*
- Statutory sites designated under national legislation, for example
    - Sites of Special Scientific Interest (England, Wales, Scotland)
    - Areas of Special Scientific Interest (Northern Ireland)
    - Marine Conservation Zones (England, Wales, Northern Ireland), Nature Conservation Marine Protected Areas (Scotland)**
    - Natural Heritage Areas (Ireland)
    - National Nature Reserves (UK)
    - Nature Reserves (Ireland)
    - Refuges for Fauna (Ireland)
    - Wildfowl Sanctuaries (Ireland)
    - Local Nature Reserves (UK)
- Locally designated wildlife sites

National Biodiversity Lists

- Habitats and species of principal importance for the conservation of biodiversity: England[49], Wales[50] and Scotland Biodiversity List[51]
- Northern Ireland priority habitats[52] and species[53]
- Protected and rare species in Ireland***[54]
- Priority Marine Features (Scotland)****[55]
- Ancient woodland inventories[56] for England, Ireland, Northern Ireland, Scotland and Wales

Biodiversity Action Plan lists

- UK BAP***** priority habitat[57] and priority species[58]
- Local BAP priority species and habitats[59]

Red Listed, Rare, Legally Protected Species

- Species of conservation concern, Red Data Book (RDB) species – UK[60]; Ireland[61]
- Birds of Conservation Concern – UK[62]; Ireland[63]
- Nationally rare and nationally scarce species – UK[64]; Ireland[65]
- Legally protected species – UK[66]; Ireland[67]
- OSPAR Commission list of threatened / declining species in the North-east Atlantic[68]

Note: there is overlap in these lists and many habitats and species appear on several.

**Including candidate SACs and proposed SPAs, SACs and Ramsar sites*

*** MCZs and NCMPAs (Scotland), plus other statutory designated sites of marine importance, are collectively defined in the UK as Marine Protected Areas.*

**** Ireland: Local Authority BAPs, Heritage Plans, Local Area Plans and County Development Plans also identify locally important species and habitats.*

*****Supersedes the Scottish Biodiversity List for marine habitats and species*

******The UK BAP lists of priority habitats and species have been superseded by the national biodiversity lists, but they are a useful reference source.*

4.4 Ecologists may identify ecological features that are not included in lists of important sites or features, but considered important on the basis of expert judgment e.g. because of their local rarity or because they enable effective conservation of other important features. For example, an area of low quality grassland neighbouring a designated saltmarsh could be considered important to allow the saltmarsh to migrate landward as a consequence of sea level rise.

4.5 Ecological features might also be important because they play a key functional role in the landscape as 'stepping stones' for migratory species to move during their annual migration cycle, as well as for species to move between sites, to disperse populations to new locations, to forage, or move in response to climate change[69]. Ecosystem processes are very important e.g. fronts and upwellings that lead to important aggregations of marine wildlife; groundwater dependent ecosystems.

4.6 Various characteristics contribute to the importance of ecological features. Examples include:

- naturalness
- animal or plant species, sub-species or varieties that are rare or uncommon, either internationally, nationally or more locally, including those that may be seasonally transient
- ecosystems and their component parts, which provide the habitats required by important species, populations and/or assemblages
- endemic species or locally distinct sub-populations of a species
- habitats that are rare or uncommon
- habitats that are effectively irreplaceable
- habitat diversity
- size of habitat or species population
- habitat connectivity and/or synergistic associations
- habitats and species in decline
- rich assemblages of plants and animals
- large populations of species or concentrations of species considered uncommon or threatened in a wider context
- plant communities (and their associated animals) that are considered to be typical of valued natural/semi-natural vegetation types, including examples of naturally species-poor communities
- species on the edge of their range, particularly where their distribution is changing as a result of global trends and climate change.

Geographic context

4.7 The importance of an ecological feature should be considered within a defined geographical context. It is recommended that the following frame of reference be used, or adapted to suit local circumstances:

- International and European
- National
- Regional
- Metropolitan, County, vice-county or other local authority-wide area
- River Basin District
- Estuarine system/Coastal cell
- Local.

4.8 Various approaches can be adopted for defining local importance, including assessment within a district, borough or parish context or within other locally defined areas. Consideration of impacts at all scales is important, and essential if objectives for no net loss of biodiversity and maintenance of healthy ecosystems are to be achieved.

4.9 The following paragraphs provide guidance on how to apply the concept of importance to assess the impacts of projects on designated nature conservation sites, habitats, species and ecosystem services.

Designated sites

4.10 For designated sites, importance should reflect the geographical context of the designation. For example, Local Wildlife Sites may be designated according to criteria applied in a county or district context, and should be considered important accordingly.

4.11 Sites that are considered to be important in an international, European and national context and protected through international and national legislation are identified on the Joint Nature Conservation Committee (UK)[70] and National Parks & Wildlife Service (Ireland)[71] protected sites webpages. Information on international and national designated sites in Scotland is also provided on SNH SiteLink[72] webpages and for Northern Ireland on the Northern Ireland Environment Agenc[73] website. Information on protected sites in Wales is provided on the NRW website[74] Where there is potential for a significant effect on such sites, the effect should be assessed in accordance with the respective statutory procedures and relevant government policy.

4.12 Where a site has multiple designations the EcIA should consider the impacts of the development in respect of each of the features of each of the designations, carefully distinguishing between them in

accordance with the respective legislation and policy. For example, where a site is both a SSSI and a SPA or SAC (in the UK), or SPA/SAC and a NHA (in Ireland), the impacts need to be assessed in respect of each of the interests and for each of the qualifying features of the SSSI, SPA, SAC or NHA, carefully applying the differing legislative and policy requirements in respect of each designation, as may be necessary.

4.13 In both UK and Ireland it is also necessary to have regard to impacts on features for which a site may be notified, designated or classified in the future. In particular, in Ireland, a suite of proposed Natural Heritage Areas (pNHAs) were published on a non-statutory basis in 1995. These should be considered important at the national scale, although they are not currently formally proposed for designation, and are generally given protection through statutory licensing restrictions and planning policies. NHAs are designated under the Wildlife (Amendment) Act 2000 and become legally protected from the time that they are statutorily proposed for designation. European case law also requires member states to ensure adequate and appropriate levels of protection for sites that may, or should, be classified as SPAs or designated as SACs.

4.14 On the rare occasion that a site no longer appears to meet the criteria relating to its designation or proposed designation, discussions should be held with the designating authority to agree how the site should be treated. Where this relates to internationally/nationally designated sites, unless the site has been formally 'de-notified', the designation still applies and the relevant national government has legal and policy obligations to ensure that the site is restored to favourable condition. It must be demonstrated in the EcIA that development will not be detrimental to the recovery of these sites.

4.15 Conversely, there may be occasions when an undesignated site is considered to meet published selection criteria for statutory or non-statutory site designation or have substantive potential to meet them. This should be used to guide the assessment of importance and discussions should be held with the potential designating authority to agree how the site should be treated.

Habitats

4.16 Habitat types of European (International) conservation importance are listed on Annex I of the Habitats Directive. Habitat types that are considered priorities for conservation in England are listed as habitats of principal importance under section 41 of the Natural Environment and Rural Communities Act 2006[75]. Habitat types of priority for conservation in Wales are listed under section 7 of the Environment (Wales) Act, 2016[76]. Habitats considered of principal importance for biodiversity in Scotland (the Scottish Biodiversity List) are listed under Part 1 section 2(4) of the Nature Conservation (Scotland) Act 2004[77] and Priority Marine Features, which supersedes marine habitats in the Scottish Biodiversity List, are listed on the Scottish Natural Heritage website[78]. Valuing Nature – A Biodiversity Strategy for Northern Ireland to 2020 refers to priority habitats and this list is hosted on the Northern Ireland Environment Agency website as the 'biodiversity list for priority habitats'[79]. Habitats protected at national level in Ireland are listed in the National Biodiversity Action Plan 2017-2021 and under the Wildlife Acts, 1976 to 2012[80]. Additional locally important habitats may be listed in local Biodiversity Action Plans[81].

4.17 There may be cases where important habitat types are affected but they are currently in a degraded or unfavourable condition. Whilst the current baseline condition of a habitat may be sub-optimal, its potential value should be considered, including its possible contribution to conservation objectives. It is essential not to under-estimate the importance of habitats in sub-optimal condition where there is potential for restoration. It is also particularly important to conserve irreplaceable habitats, as reflected in the England National Planning Policy Framework (2018)[82].

Species

4.18 Species of European (International) conservation importance are listed on Annexes II, IV and V of the Habitats Directive and Annex I of the Birds Directive. Species that are considered to be priorities for conservation in England are listed as species of principal importance under sections 41 of the Natural Environment and Rural Communities Act, 2006[83]. Species that are priority for conservation in Wales are listed under section 7 of the Environment (Wales) Act, 2016[84]. Species considered of principal importance for biodiversity in Scotland (the Scottish Biodiversity List) are listed under Part 1 section 2(4) of the Nature Conservation (Scotland) Act 2004[85] and Priority Marine Features, which supersedes marine species in the Scottish Biodiversity List are listed on the Scottish Natural Heritage website[86]. The Northern Ireland Biodiversity Strategy lists 'Priority Species' and the list is hosted on the Northern Ireland Environment Agency website[87]. There is no equivalent list of national priority species in Ireland, apart from species protected under the Wildlife Acts 1976 to 2012[88], Red Lists[89] and Birds of Conservation Concern in Ireland[90] species. Additional locally important species may be listed in local Biodiversity Action Plans (see Box 13 for additional lists of important species for nature conservation).

4.19 Deciding the importance of species populations should make use of existing criteria where available. For example, there are established criteria for defining nationally and internationally important populations of waterfowl. The scale within which importance is determined could also relate to a particular population, e.g. the breeding population of common toads within a suite of ponds or an otter population within a catchment.

4.20 When determining the importance of a species population, contextual information about distribution and abundance is fundamental, including trends based on historical records. For example, a species could be considered particularly important if it is rare and its population is in decline.

Legally protected species

4.21 Specific species have legal protection under Annex IV of the EC Habitats Directive[91] and the appropriate national regulations. In the UK, other species are protected under the Wildlife and Countryside Act 1981 (as amended), the Wildlife and Natural Environment (Northern Ireland) Act 2011[92], the Nature Conservation (Scotland) Act 2004[93] and the Marine (Scotland) Act 2010[94]. In Ireland, species are protected under the Wildlife Acts 1976 to 2012, the Flora (Protection) Order 2015, and the European Communities (Birds and Natural Habitats) Regulations 2011 (SI 477 of 2011)[95].

4.22 Lists of legally protected species may require careful interpretation. For example, in England and Wales birds listed in Schedule 1 of the Wildlife and Countryside Act 1981 (as amended) have special legal protection against disturbance during the breeding season in addition to the general protections afforded to birds. Caution should also be applied when referring to the lists of animal and plant species of Community interest in Annex II of the EC Habitats Directive lists and Annex 1 the EC Birds Directive[96]. These species have no specific legal protection under these Annexes except insofar that SACs and SPAs may be designated because of the presence of these species and that they should be conserved on these sites as defined.

4.23 Where protected species are present and there is the potential for a breach of the legislation, those species should always be considered as 'important' features. It will always be necessary for the EcIA to determine whether there could be a breach of the legislation as a result of the project, and the scheme being assessed needs to be designed/mitigated in such a way that the law will not be contravened.

Legally controlled species

4.24 Consideration should also be given to ensuring that land use changes do not result in contravention of laws relating to legally controlled plant and animal species under Schedule 9 of the Wildlife and Countryside Act 1981 in Britain (e.g. Japanese knotweed, Himalayan balsam, giant hogweed), under the Wildlife (Northern Ireland) Order 1985 (as amended), under the Wildlife and Natural Environment (Scotland) Act 2011, under the Wildlife Acts 1976 to 2012 in Ireland, and under the Third Schedule of the European Communities (Birds and Natural Habitats) Regulations 2011 (SI 477 of 2011). See also Invasive Species Ireland[97]. In addition, five plants (common ragwort, broad-leaved dock, curled dock, creeping thistle, spear thistle) are identified as injurious in the Weeds Act 1959 (as amended by The Ragwort Control Act 2003 England and Wales)[98]. The relevant agricultural weed control legislation for Ireland is the Noxious Weeds Act 1936, and weed species to which the Act applies have been added by ministerial orders. EcIA should, where appropriate, identify how such species will be controlled. An EU Regulation[99] on invasive alien species came into force on 1 January 2015.This has led to the identification of Invasive Alien Species of Union Concern and establishes measures for prevention, early detection, rapid eradication, and management. This has not been transposed into legislation in the UK or Ireland, but is supported, for example, by the GB Invasive Non-native Species Strategy (2015)[100].

Ecosystem services and natural capital

4.25 Ecosystem services are the benefits that people derive from the natural environment. The natural environment can be considered as a stock of 'natural capital' from which many benefits flow – social, health-related, cultural or economic. Box 15 includes policy guidance on ecosystem services and a summary of types of ecosystem services is provided in Box 16.

Box 15: Ecosystem services in policy

UK National Ecosystem Assessment (2011) and UKNEA Follow-on (2014)[101]

The UK Government conducted a full national ecosystem assessment to enable effective policy responses to degradation of ecosystem services. Consistent with the Millennium Ecosystem Assessment (2005), it identifies four broad categories of ecosystem services. It provides a starting point for identifying links between ecological features (e.g. broad habitats) and ecosystem services and assessing how land use change might affect the value that ecosystems provide. The *UKNEA Follow-on* further developed the assessment and its applicability to decision and policy making.

Natural Environment White Paper (2011) – The natural choice: securing the value of nature[102]

This sets out a broad 50-year vision for the natural environment and how Government in England intends to put natural capital at the heart of economic thinking and decision making. The White Paper outlines a number of initiatives to restore the natural environment, new programmes for connecting people and nature, and several proposals for capturing the economic value of nature and measuring green growth.

A Green Future: Our 25 Year Plan to Improve the Environment (2018)[103]

This UK Government 25 year plan for the environment frames its goals and targets around the primary goods and benefits provided by a healthy environment. It is underpinned by the natural capital approach and seeks to embed a 'net environmental gain' principle into development.

Environment (Wales) Act, 2016[104]

This Act focuses on the sustainable management of natural resources. It has the core objective of maintenance and enhancement of ecosystems and the benefits that they provide for people. The Act sets a duty on public authorities to take account of the resilience of ecosystems.

Applying an ecosystems approach to land use: Information Note (2011)[105]

This publication by The Scottish Government encourages the application of an ecosystems approach in decision-making processes affecting land use. It gives examples of the application of this approach in Scotland and elsewhere in the UK.

2020 Challenge for Scotland's Biodiversity (2013)[106]

This is Scotland's response to international biodiversity targets. The chapter on natural capital reflects the TEEB (The Economics of Ecosystems and Biodiversity) and UKNEA reports and includes principles for sustaining the value of Scotland's natural capital. The Challenge has links to Scotland's Land Use Strategy 2016-2021 and has an ecosystem approach as its central feature. It takes into account the needs of people, and provides the overall framework for delivery of local BAPS in Scotland, many of which have been updated to take an ecosystem approach into account

Sectoral Impacts on Biodiversity and Ecosystem Services (SIMBIOSYS) (2013)[107]

This project funded by the Irish Government examined the impacts of human activity on biodiversity and the benefits of biodiversity to society. It quantifies impacts of particular activities in Ireland (e.g. cultivation of bioenergy crops, road landscaping and aquaculture) on genetic, species and landscape biodiversity and the ecosystem services they provide, including pollination, biological pest control, carbon sequestration and resistance to alien species.

National Biodiversity Action Plan 2017-2021[108] *(Ireland)*

This Plan promotes the importance of the wide range of ecosystems, habitats and species to society through the concepts of natural accounting and an increased recognition of the value of ecosystem services.

Box 16: Types of ecosystem services

Supporting services – services necessary for the production of all other ecosystem services including soil formation, photosynthesis, primary production, nutrient cycling and water cycling.

Provisioning services – products obtained from ecosystems, including food, fibre, fuel, genetic resources, biochemicals, natural medicines, pharmaceuticals and fresh water.

Regulating services – benefits obtained from the regulation of ecosystem processes, including air quality regulation, climate regulation, water regulation, erosion regulation, water purification, disease regulation, pest regulation, pollination, natural hazard regulation.

Cultural services – non-material benefits people obtain from ecosystems through spiritual enrichment, cognitive development, reflection, recreation and aesthetic experiences – thereby taking account of landscape values.

4.26 EcIA can provide ecological information to support the assessment of ecosystem services. It is important to recognise cases where ecosystem service provision might be affected as a result of a project's ecological effects. However, assessment of ecosystem services relies on separate specialist assessments of social and economic value. Ecologists can work together with other specialists to ensure that relevant data is collected during the EcIA process to inform these separate assessments. This can enable the social and economic implications of ecological changes to be taken into account.

5 IMPACT ASSESSMENT

Introduction

5.1 The impact assessment process involves:

- identifying and characterising impacts and their effects
- incorporating measures to avoid and mitigate negative impacts and effects
- assessing the significance of any residual effects after mitigation
- identifying appropriate compensation measures to offset significant residual effects
- identifying opportunities for ecological enhancement.

The terms 'impacts' and 'effects' are explained at the end of Chapter 1. The hierarchical process of avoiding, mitigating and compensating ecological impacts and their effects is explained further in paragraph 1.19 and Chapter 6.

5.2 In EcIA it is only essential to assess and report significant residual effects that remain after mitigation measures have been taken into account (see paragraphs 5.24 to 5.28). However, it is good practice for the EcIA to make clear both the potential significant effects without mitigation and the residual significant effects following mitigation, particularly:

a) where the mitigation proposed is experimental, unproven or controversial; or
b) to demonstrate the importance of securing the measures proposed through planning conditions or obligations.

5.3 Assessment of ecological impacts is required at the following stages:

- during initial scoping – to provide the basis for selecting ecological features within the zone(s) of influence that require systematic assessment
- during the evolution of the project – to identify the need for avoidance and mitigation and opportunities for enhancement
- after mitigation strategies have been devised and their likely success considered – to assess residual effects and whether these are significant and require compensation.

5.4 The assessment should include potential impacts on each ecological feature determined as 'important' (Chapter 4) from all phases of the project, e.g. construction, operation and decommissioning. Impacts should be characterised, through consideration of their magnitude and/or extent, the route through which they occur (whether direct, indirect, secondary or cumulative) and their duration and their reversibility. Positive impacts should be assessed as well as negative ones.

5.5 The assessment of impacts should take into account the baseline conditions to allow:

- a description of how the baseline conditions will change as a result of the project and associated activities
- the identification of cumulative impacts arising from the proposal and other relevant developments.

5.6 The significant effects must be assessed in the context of the predicted baseline conditions within the zone(s) of influence during the lifetime of the development (see Chapter 3). Information may be required from other specialists as impacts may relate to noise, air quality, hydrology, water quality, coastal processes etc. Liaison with other disciplines will enable more robust predictions for project-related bio-physical changes and assessment of their ecological implications. Cross-reference should be made to other assessments submitted with the project proposal.

Predicting Ecological Impacts and Effects

5.7 The process of predicting ecological impacts and effects should take account of relevant aspects of ecosystem structure and function – see Box 17.

Box 17: Aspects of ecological structure and function to consider when predicting impacts and effects

Available resources

- territory – hunting/foraging grounds, shelter and roost sites, breeding and spawning sites, corridors for migration and dispersal, stop-over sites
- food and water (quantity and quality)
- soil minerals and nutrients and hydrochemistry
- solar radiation, light penetration and gaseous resources
- water movement and connectivity

Environmental processes

- flooding, drought, wind blow and storm damage, disease, eutrophication, erosion, deposition and other geomorphological processes, fire, temperature fluctuations and climate change
- additional marine, oceanographic and physical-chemical processes, including wind and weather patterns, wave and tidal conditions and sedimentary processes

Ecological processes and relationships

- population dynamics – population cycles, survival / reproduction rates, competition, predation, seasonal behaviour, dispersal / genetic exchange
- vegetation dynamics– colonisation, succession, competition, and nutrient-cycling
- food webs, predator-prey relationships, herbivore/planktivore food-source relationships, herbivore-carnivore relationships, adaptation, and dynamism
- decomposer, primary producer, parasite, predator, keystone species

Human influences

- animal husbandry, cutting, burning, mowing, draining, irrigation, culling, hunting, excavations, dredging, ground profiling, water abstraction, ploughing, seeding, planting, cropping, fertilising, pesticides, herbicides, pollution and contamination, introduction of non-native species, weeds and genetically modified organisms, disturbance from public access and recreation, pets, transport
- aquaculture husbandry, fishing activities, bait digging, shellfisheries, kelp harvesting, maintenance dredging, coastal defence, flow regulation

Historical context

- natural range of variation over recorded historical period
- irregular perturbations beyond normal range (e.g. very infrequent storm events)
- historical human influence, e.g. water quality changes, land claim, species exploitation
- geomorphological evolution

Ecosystem properties

- fragility and stability, carrying capacity and limiting factors, productivity
- connectivity
- open/closed system
- source/sink
- numbers in a population or meta-population, minimum viable populations
- sex and age ratios
- patchiness and degree of fragmentation
- ecological coherence

Other environmental influences

- air quality
- hydrology and water quality
- nutrient status and salinity

Adapted from: Developing Naturally. A handbook for incorporating the natural environment into planning and development[109]

5.8 There could be any number of possible impacts on important ecological features arising from a development. However, it is only necessary to describe in detail the impacts that are likely to be significant (see paragraphs 5.24 to 5.28). Impacts that are either unlikely to occur, or if they did occur are unlikely to be significant, can be scoped out. For transparency, justification for scoping out any ecological impact should be provided. If in doubt, the potential impact should be assessed.

Characterising Ecological Impacts

5.9 When describing ecological impacts and effects, reference should be made to the following characteristics as required:

- positive or negative
- extent
- magnitude
- duration
- frequency and timing
- reversibility.

5.10 The assessment only needs to describe those characteristics relevant to understanding the ecological effect of the impacts and determining its significance. For example, timing of the removal of a hedgerow is unlikely to be of particular relevance to the assessment of the effect on hedgerows, although it may be relevant in assessing the effect on a species using the hedgerow, such as nesting birds.

Positive or negative

5.11 Positive and negative impacts and effects should be determined according to whether the change is in accordance with nature conservation objectives and policy:

- positive – a change that improves the quality of the environment e.g. by increasing species diversity, extending habitat or improving water quality. This may also include halting or slowing an existing decline in the quality of the environment.
- negative – a change which reduces the quality of the environment e.g. destruction of habitat, removal of foraging habitat, habitat fragmentation, pollution.

Extent

5.12 The extent is the spatial or geographical area over which the impact/effect may occur under a suitably representative range of conditions (e.g. noise transmission under water).

Magnitude

5.13 Magnitude refers to size, amount, intensity and volume. It should be quantified if possible and expressed in absolute or relative terms e.g. the amount of habitat lost, percentage change to habitat area, percentage decline in a species population.

Duration

5.14 Duration should be defined in relation to ecological characteristics (such as the lifecycle of a species) as well as human timeframes. For example, five years, which might seem short-term in the human context or that of other long-lived species, would span at least five generations of some invertebrate species.

5.15 The duration of an activity may differ from the duration of the resulting effect caused by the activity. For example, if short-term construction activities cause disturbance to birds during their breeding period, there may be long-term implications from failure to reproduce that season. Impacts and effects may be described as short, medium or long-term and permanent or temporary. These will need to be defined in months/years.

Frequency and timing

5.16 The number of times an activity occurs will influence the resulting effect. For example, a single person walking a dog will have very limited impact on nearby waders using wetland habitat, but numerous walkers will subject the waders to frequent disturbance and could affect feeding success, leading to displacement of the birds and knock-on effects on their ability to survive.

5.17 The timing of an activity or change may result in an impact if it coincides with critical life-stages or seasons e.g. bird nesting season.

Reversibility

5.18 An irreversible effect is one from which recovery is not possible within a reasonable timescale or there is no reasonable chance of action being taken to reverse it. A reversible effect is one from which spontaneous recovery is possible or which may be counteracted by mitigation. In some cases, the same activity can cause both reversible and irreversible effects. Examples of reversible and irreversible effects are provided in Box 18 below.

Box 18: Examples of reversible and irreversible effects

Ancient woodland

Placement of a temporary access through an ancient wood could cause the loss of food and shelter for common woodland birds that may be reversible, but the compaction of woodland soils and damage to ancient woodland ground flora along the access route is irreversible

Cold-water coral reefs

Irreversible damage can be caused by the destruction of cold-water coral reefs by fishing trawls. These structures on the deep seabed have formed slowly over thousands of years, and their removal also removes the essential habitat for their associated fauna.

Species populations

The loss of small numbers of individuals of a rapidly breeding species could be considered reversible where the overall population is sufficiently robust to recover in terms of numbers and distribution within a relatively short space of time. In some cases, the loss of small numbers of individuals could push a population into a long-term decline from which it is not capable of recovering, causing an irreversible effect. This could occur as a result of the population not being sufficiently robust to recover or where it is suffering from other limiting factors made worse by the development project.

Assessment of Cumulative Impacts and Effects

5.19 Cumulative effects can result from individually insignificant but collectively significant actions taking place over a period of time or concentrated in a location. Cumulative effects are particularly important in EcIA as ecological features may be already exposed to background levels of threat or pressure and may be close to critical thresholds where further impact could cause irreversible decline. Cumulative effects can also make habitats and species more vulnerable or sensitive to change.

5.20 Different types of actions can cause cumulative impacts and effects:

- Additive/incremental – multiple activities/projects (each with potentially insignificant effects) added together to give rise to a significant effect due to their proximity in time and space. The effect may be additive (1+1 = 2) or synergistic (1+1 = 3).

- Associated/connected – a development activity enables another development activity e.g. phased development as part of separate planning applications. Associated developments may include different aspects of the project which may be authorised under different consent processes. It is important to assess impacts of the project as a whole and not ignore impacts that fall under a separate consent process.

5.21 Developments to be included in the cumulative impact assessment should be in accordance with national guidance and, if possible, agreed with the competent authority during scoping. In most cases other projects to be considered would include the following types of future development within the same zone of influence:

- proposals for which consent has been applied which are awaiting determination in any regulatory process (not necessarily limited to planning permission)
- projects which have been granted consent (not limited to planning permissions) but which have not yet been started or which have been started but are not yet completed (i.e. under construction)
- proposals which have been refused permission but which are subject to appeal and the appeal is undetermined
- to the extent that their details are in the public domain, proposed projects that will be implemented by a public body but for which no consent is needed from a competent authority.

In some situations, it may be necessary to also consider:

- constructed developments whose full environmental effects are not yet felt and therefore cannot be accounted for in the baseline
- developments specifically referenced in a National Policy Statement, a National Plan or a Local Plan (draft or adopted).

5.22 Information about developments within the zone(s) of influence may be available in other EcIAs, Local Plan documents, Marine Spatial Plans, Strategic Environmental Assessments (SEAs), Sustainability Appraisals (SAs), Water Framework Directive Assessments (WFDAs), and Habitats Regulations Assessments/Appraisals (HRAs), including 'Natura Impact Statements' (NISs) / 'Natura Impact Reports' (NIRs), 'Information / 'Reports to Inform an Appropriate Assessment', 'Shadow Habitats Regulations Assessments' and, for Nationally Significant Infrastructure Projects, 'Reports on the Implications for European Sites' (RIES). The local planning authority, wildlife trust and statutory nature conservation bodies (SNCB) may also be able to advise on appropriate development projects to consider.

Assessment of Residual Impacts

5.23 After assessing the impacts of the proposal, all attempts should be made to avoid and mitigate ecological impacts (Chapter 6). Once measures to avoid and mitigate ecological impacts have been finalised, assessment of the residual impacts should be undertaken to determine the significance of their effects on ecological features. Any residual impacts that will result in effects that are significant, and the proposed compensatory measures, will be the factors considered against ecological objectives (legislation and policy) in determining the outcome of the application (Chapter 7).

Significant Effects

5.24 Significance is a concept related to the weight that should be attached to effects when decisions are made. For the purpose of EcIA, 'significant effect' is an effect that either supports or undermines biodiversity conservation objectives for 'important ecological features' (explained in Chapter 4) or for biodiversity in general. Conservation objectives may be specific (e.g. for a designated site) or broad (e.g. national/local nature conservation policy) or more wide-ranging (enhancement of biodiversity). Effects can be considered significant at a wide range of scales from international to local.

5.25 A significant effect is simply an effect that is sufficiently important to require assessment and reporting so that the decision maker is adequately informed of the environmental consequences of permitting a project. A significant effect is a positive or negative ecological effect that should be given weight in judging whether to authorise a project: it can influence whether permission is given or refused and, if given, whether the effect is important enough to warrant conditions, restrictions or further requirements such as monitoring. A significant effect does not necessarily equate to an effect so severe that consent for the project should be refused planning permission. For example, many projects with significant negative ecological effects have been lawfully permitted following EIA procedures.

5.26 In broad terms, significant effects encompass impacts on the structure and function of defined sites, habitats or ecosystems and the conservation status of habitats and species (including extent, abundance and distribution).

5.27 Significant effects should be qualified with reference to an appropriate geographic scale. For example, a significant effect on a Site of Special Scientific Interest or Natural Heritage Area is likely to be of national significance. European case law is specific regarding significance in relation to European sites and Annexed habitats. However, the scale of significance of an effect may not be the same as the geographic context in which the feature is considered important (Chapter 4). For example, an effect on a species which is on a national list of species of principal importance for biodiversity may not have a significant effect on its national population. Examples of other relevant scales include regional and county. It should be noted that effects may be significant at the local scale, particularly in view of policies for no net loss of biodiversity.

5.28 When seeking mitigation or compensation solutions, efforts should be consistent with the geographical scale at which an effect is significant. For example, mitigation and compensation for effects on a species population significant at a county scale should ensure no net loss of the population at a county scale. The relative geographical scale at which the effect is significant will have a bearing on the required outcome which must be achieved.

Determining Ecologically Significant Effects

Designated/defined sites and ecosystems

5.29 Significant effects encompass impacts on the structure and function of defined sites and ecosystems. The following need to be determined:

- for designated sites – is the project and associated activities likely to undermine the conservation objectives of the site, or positively or negatively affect the conservation status of species or habitats for which the site is designated, or may it have positive or negative effects on the condition of the site or its interest/qualifying features?
- for ecosystems – is the project likely to result in a change in ecosystem structure and function?

Consideration should be given to whether:

- any processes or key characteristics will be removed or changed
- there will be an effect on the nature, extent, structure and function of component habitats
- there is an effect on the average population size and viability of component species.

5.30 Consideration of functions and processes acting outside the formal boundary of a designated site is required, particularly where a site falls within a wider ecosystem e.g. groundwater dependent terrestrial ecosystems can be damaged where the proposed activity impacts on the quantity or quality of groundwater that feeds these habitats[110]. Predictions should always consider wider ecosystem processes.

5.31 Many ecosystems have a degree of resilience to perturbation that allows them to tolerate some biophysical change. Ecological effects should be considered in the light of any information available or reasonably obtainable about the capacity of ecosystems to accommodate change.

Habitats and species

5.32 Consideration of conservation status is important for evaluating the effects of impacts on individual habitats and species and assessing their significance:

- habitats – conservation status is determined by the sum of the influences acting on the habitat that may affect its extent, structure and functions as well as its distribution and its typical species within a given geographical area
- species – conservation status is determined by the sum of influences acting on the species concerned that may affect its abundance and distribution within a given geographical area.

5.33 In many cases (e.g. for species and habitats of principal importance for biodiversity), there may be an existing statement of the conservation status of a feature and objectives and targets against which the effect can be judged. However, not all species or habitats will be described in this way and the conservation status of each feature being assessed may need to be agreed with the relevant statutory nature conservation body and set out in the EcIA. The conservation status of a habitat or species will vary depending on the geographical frame of reference.

5.34 When assessing potential effects on conservation status, the known or likely background trends and variations in status should be taken into account. The level of ecological resilience or likely level of ecological conditions that would allow the population of a species or area of habitat to continue to exist at a given level, or continue to increase along an existing trend or reduce a decreasing trend, should also be estimated.

Precautionary Principle

5.35 The evaluation of significant effects should always be based on the best available scientific evidence. If sufficient information is not available further survey or additional research may be required. In cases of reasonable doubt, where it is not possible to robustly justify a conclusion of no significant effect, a significant effect should be assumed. Where uncertainty exists, it must be acknowledged in the EcIA.

The Marine Context

5.36 Within marine and estuarine environments, the assessment of impacts and the evaluation of significance have some distinct considerations that are not always associated with terrestrial or freshwater habitats. For example, marine environments are often very dynamic and highly changeable over varying timescales. They can also exhibit high levels of physical and ecological connectivity even across quite wide expanses (coastlines, estuarine systems and transnational boundaries) and are also generally less visible and accessible for observation and monitoring. These factors influence the potential nature, scale and extent of environmental changes as well as the way in which marine and estuarine species and habitats are sensitive/vulnerable to these changes. They also influence the extent to which we can understand and quantify cause and effect responses. These distinctive factors and the particular role of uncertainty in the context of the Precautionary Principle need to be recognised for EcIAs that cover marine environments.

5.37 It is also important to recognise that adaptive mitigation and monitoring strategies (Adaptive management) can often be adopted successfully to resolve residual uncertainties about the significance of effects of impacts in the marine environment and to provide necessary assurances as to the absence of negative effects. Adaptive management is a decision process that promotes flexible decision making that can be adjusted in the face of uncertainties as outcomes from management actions and other events become better understood. Careful monitoring of these outcomes both advances scientific understanding and helps adjust policies or operations as part of an iterative learning process. These adaptive solutions have also been referred to as 'deploy and monitor' techniques (as applied within Scotland's marine renewable energy sector for example) or as 'iterative implementation' processes (as used over recent years for the implementation of strategic marine plans in the UK). However, this approach should only be adopted if uncertainty cannot be sufficiently resolved and there is a compelling case for taking forward the project.

Alternative Approaches

5.38 There are a number of approaches for determining the significance of effects on ecological features. This includes methods for scoring and ranking impacts on the basis of subjective criteria. Results are often presented in the form of a matrix in which ecological value/importance and magnitude of impact are combined into a significance score. A matrix approach is commonly used in EIA by disciplines other than ecology to assign significant residual effects to categories (e.g. major, moderate, minor). In many cases, its use is required to provide consistency across all the topics of an Environmental Statement. If using this approach, it is very important to make a clear distinction between evidence-based and value-based judgements so that decision-makers and other stakeholders are aware of the level of subjective evaluation that has been used. Spurious quantification should be avoided in which numerical scores or significance rankings/categories are used without a clear definition of the criteria and thresholds that underpin them. These Guidelines avoid and discourage use of the matrix approach and categorisation. An alternative approach for categorising significant residual effects without using a matrix[111] makes it clear that the suggested approach should not be used routinely, but only where categorisation has been specifically required.

Example Assessment of the Significance of Effects

5.39 Example assessments of the significance of effects are provided in Appendix 1 and Appendix 2. The example assessment in Appendix 1 considers the effects of a road-widening scheme on a Cetti's warbler population. The example assessment in Appendix 2 considers the effects of an offshore wind farm on marine habitats and lesser black-backed gulls. A summary of impacts and effects is given in a separate table at the end of each appendix.

5.40 The example assessments document both the significance of the effects without mitigation, and the significance of the effects of the residual impacts taking mitigation into account. Some EcIAs only document the significant effects of the residual impacts. Both methods are acceptable. However, documenting the effects of impacts without mitigation can help to make the EcIA more transparent and can be useful to the competent authority when assessing the adequacy of proposed mitigation.

6 AVOIDANCE, MITIGATION, COMPENSATION AND ENHANCEMENT

Introduction

6.1 A sequential process should be adopted to avoid, mitigate and compensate negative ecological impacts and effects. This is often referred to as the 'mitigation hierarchy' (see 1.19 and 5.1). For most projects, avoidance, mitigation, compensation and enhancement measures should be identified as part of the EcIA process.

Avoidance and Mitigation

6.2 Negative impacts should always be avoided where possible, for example by deciding not to locate a project in a particular area or making a change to scheme layout to ensure no negative impacts. Avoidance can also be part of mitigation. Mitigation includes measures to avoid or reduce the negative impacts of a project, for example careful timing of an activity to prevent an impact occurring.

6.3 Avoiding and/or minimising negative impacts is best achieved through consideration of potential impacts of a project from the earliest stages of scheme design and throughout its development. Many impacts can be avoided or reduced by consideration of alternatives.

6.4 Mitigation measures incorporated into the scheme design are often described as 'embedded mitigation' or 'mitigation by design'. This can include the re-design of the layout of the scheme, or adjusting the location of certain activities. Mitigation by design is particularly beneficial as there is greater certainty that it will be delivered. Wherever possible mitigation should be by design rather than left to a request by the competent authority. In Ireland, NPWS has produced guidance for developers in the construction and extractive sectors[112]. The efficacy and any potential knock-on effects of both embedded and non-embedded mitigation should always be assessed.

Compensation

6.5 Compensation describes measures taken to offset residual effects resulting in the loss of, or permanent damage to, ecological features despite mitigation. For example, it may take the form of replacement habitat or improvements to existing habitats. Compensation can be provided either within or outside the project site (defined by the red line of a planning application). Compensation should always be seen as a last resort, when all other mitigation options have been exhausted. Compensation is particularly difficult to achieve in the marine environment (see paragraph 5.36).

6.6 As a general rule, compensation should be focused on the same type of ecological features as those affected and equivalent levels of ecological 'functionality' sought. There will be cases when it is not possible to achieve ecological equivalence through compensation. Any replacement area should be similar in terms of ecological features and ecological functions that have been lost or damaged, or with appropriate management have the ability to reproduce the functions and conditions of those ecological features. Compensation should be provided as close as possible to the location where effects have occurred and benefit the same habitats and species as those affected.

6.7 Replacement ratios of compensatory habitat greater than one-to-one are frequently appropriate because of the uncertainty inherent in compensation, particularly in cases which require ecological restoration, habitat creation or translocation of species or habitats. The scientific basis for deriving appropriate ratios is not exact and will vary depending on the habitat or species concerned. Increased replacement ratios can also help take account of the time lag in delivering compensation and regaining the same maturity, complexity and diversity of habitats and the full complement of associated species.

6.8 Biodiversity offsets is a concept that provides a measurable approach to compensation with the aim of achieving 'no net loss'[113]. Box 19 summarises biodiversity offsets.

Box 19: No net loss and biodiversity offsets

Biodiversity offsets are a form of compensation which may be considered when a development is expected to have significant residual impacts on biodiversity despite planned mitigation measures. Biodiversity offsets have a formal requirement for measurable outcomes. The main requirement is to quantify losses (through effects, after avoidance and mitigation) and gains (through offsets) using the same 'metric', for example hectares of habitat of a particular quality[114]. Using an offset metric in this way provides for transparency of outcome and enables explicit demonstration of 'no net loss'. Such metrics can also be used to support the achievement of net gains (see paragraphs 6.11 to 6.13).

6.9 The delivery of compensation measures, including biodiversity offsets, is likely to involve access to land, or land purchase, outside a scheme footprint and a commitment to long-term management through legal agreements. They therefore require early consideration in project design. The principles of offsetting should be agreed with the competent authority at an early stage, particularly where this is not clearly set out in a policy or biodiversity offsetting strategy.

6.10 The distinction between mitigation and compensation can be difficult to determine. Where ecological equivalence can be delivered within the project site this is sometimes incorrectly considered mitigation rather than compensation. However, the correct distinction between mitigation and compensation is that mitigation avoids or reduces the occurrence of negative impacts and effects and compensation addresses effects which are residual, after avoidance and mitigation have been considered. Measures to address impacts and effects that will occur should therefore be referred to as compensation whether the compensation is located within or outside of the project site.

Enhancement

6.11 It is important that development is sustainable and, where possible, projects produce a net gain for biodiversity and nature conservation. National policies promote the inclusion of measures to enhance biodiversity within development proposals. Enhancement of biodiversity should be an objective of all projects. Principles for achieving net gain within development have been published by CIEEM, CIRIA and IEMA (2016)[115].

6.12 Enhancement is improved management of ecological features or provision of new ecological features, resulting in a net benefit to biodiversity, which is unrelated to a negative impact or is 'over and above' that required to mitigate/compensate for an impact. For example, mitigation for bats may involve erecting bat boxes in a woodland to replace suitable bat *roosting* features that have been removed, and the woodland habitat itself may be enhanced for *foraging* bats by increased woodland planting and the creation of glades. Enhancement could be linked to the delivery of wider socio-economic benefits such as wetland restoration and flood risk management. Enhancement measures should be described in the EcIA.

6.13 Enhancement measures should be designed to deliver biodiversity objectives that are specified in relevant policy documents, and evidence should be provided to support the likelihood of delivering the predicted benefit. They should be incorporated into scheme design and assessed within the EcIA. To ensure that enhancements are enduring, their delivery and management should normally be guaranteed through a legal obligation, such as, in England and Wales, a planning obligation under section 106 of the Town and Country Planning Act 1990[116], or its equivalent provision elsewhere.

Designing Mitigation and Compensation

6.14 The design of mitigation and compensation measures is an iterative process. It needs to consider what is realistically achievable and the likely extent to which success can be guaranteed, based on good practice guidance and evidence. Measures need to be agreed and a commitment made by the developer before a planning application is submitted to the competent authority. Such commitments must then also be agreed with the competent authority and secured through appropriate planning conditions, consents, permits and/or legal agreements. The aim should be to provide the competent authority with as much certainty as possible over the likely effectiveness and deliverability of the proposed measures (see BS 42020 clauses 6.6 and 8.1[117]).

6.15 Mitigation and compensation measures should address specific effects. For example, where a development will result in an effect on the conservation status of a population of great crested newts (or, for example, common frog and smooth newts in Ireland) through the loss of terrestrial foraging habitat, compensation should involve the provision of new foraging habitat rather than new breeding ponds. Mitigation and compensation measures should achieve long-term results. Their duration should match the duration of the impact.

6.16 Mitigation, compensation and enhancement measures should have defined criteria for success, which allows success or failure to be measured by monitoring. It is not appropriate to propose measures that cannot be delivered within a reasonable time frame, or simply present a wish-list of measures.

6.17 However, mitigation measures can include 'contingency measures' where there is uncertainty as to whether or not an effect will occur. For example, this may be relevant to effects that only occur if activities take place at particular times of year (such as site clearance during the bird nesting season), or as a result of unpredictable changes (such as where a badger sett, absent at the time of the EcIA, has been established prior to construction). In such cases the contingency measures should identify how such issues will be resolved and consider the possible effects on the project programme.

6.18 For many species, particularly those with legal protection, there is published guidance that describes appropriate approaches to mitigation. In some cases, it will be necessary to design new approaches to mitigate an effect, and the advice of relevant experts and statutory and non-statutory consultees should be sought. If standard methods are not being used, this will need to be explained and justified.

6.19 In some cases compensation measures will need to be in place and 'functioning' before the significant harm occurs. This is particularly likely where the effect is on designated sites or legally protected species. Lead-in times to deliver the measures will need to be carefully considered and explicitly stated in the EcIA.

6.20 The design of mitigation and compensation measures should be revisited with other members of the design team as there may be constraining factors or knock-on effects that need to be considered by other specialists: an integrated approach will increase successful delivery of the design. Should mitigation for one habitat or species have a negative effect on another, it may still be appropriate to implement the mitigation, although the negative effects will need to be considered in the assessment.

Delivery

6.21 Mitigation and compensation measures often carry a degree of uncertainty. Uncertainty associated with a design will vary according to a number of factors, and where necessary these should be discussed in the relevant section of the EcIA. Factors to be considered include:

- technical feasibility of what is proposed – using experience from projects where a similar measure has been carried out
- overall quantity of what is proposed – is it large enough to be viable? Is it of equivalent function to any habitat lost?
- overall quality of what is proposed – does it compare favourably with features lost or damaged?
- level of commitment – is there a realistic understanding of the resources and effort required to achieve predicted outcomes?
- provision of long-term management
- timescale for predicted benefits.

Reporting Mitigation, Compensation and Enhancement

6.22 The description of mitigation, compensation and enhancement measures within the EcIA must be sufficient to allow the competent authority and relevant stakeholders to see clearly how effects will be addressed. The level of detail needed will vary between schemes, between different measures within a scheme and should include quantity, location, timing, techniques and resources.

6.23 It is helpful to set out how a project has evolved in response to ecological considerations and to indicate how mitigation that has been incorporated into the scheme design has avoided or minimised negative impacts. Presenting the results of the assessment 'with' and 'without' mitigation allows the need for mitigation and/or compensation to be clearly identified. Where mitigation is fully integrated into the scheme and there is high confidence that it will be implemented, it may be appropriate simply to assess the significance of effects of the mitigated project, with this assessment reflecting the likelihood of the incorporated measures being successful. Where there is any uncertainty, then the with/without mitigation approach to assessment described above should be used to ensure transparency.

6.24 Ideally, details of mitigation, compensation and enhancement measures will be incorporated into an Ecological Design Strategy (EDS) or Environmental Management Plan (EMP) which sets out methods and responsibilities for delivery. The plan should detail timescales for delivery and key criteria for judging success.

Monitoring

6.25 The EcIA should set out the ecological monitoring required to audit predicted impacts and effects against the actual situation. This will enable any necessary remedial action to be taken, including adjustment to the activity generating the impacts and adjustment to the mitigation or compensation measures.

6.26 The EcIA should identify where monitoring is required for mitigation, compensation and enhancement measures. It should set out the methods to be used, the criteria for determining success/failure, appropriate timing, mechanisms for implementation, frequency and duration of monitoring, and frequency of reporting.

6.27 Monitoring should be secured through a planning condition or obligation built into legal agreements, which the proponent must implement fully (Chapter 7). Monitoring may be used to determine:

- whether the measures have been implemented as agreed
- the success/effectiveness of the measures
- early warning of proposed measures which are not proving effective
- how to remedy the situation should any of the implemented measures fail e.g. due to lack of management.

6.28 Where measures are routinely applied and can be relied upon to deliver well tried and tested mitigation, monitoring is unlikely to be necessary, so long as the competent authority is able to enforce the measures. However, where there are uncertainties in predicting the effectiveness of measures, or mitigation packages are novel, monitoring will be required to determine whether the predicted efficacy of the mitigation meets expectations. In the case of major projects, good practice established in the marine and coastal environment has seen the development of legally binding Mitigation, Compensation and Monitoring Agreements (MCMA). These documents clearly define the measures that need to be taken if the project is to be consented.

6.29 It is vital that monitoring has clear indicators of success or failure, set against a suitable baseline. Monitoring needs to have clear aims and objectives to specifically determine the success of the measures, both in the short-term and longer-term. Longer-term monitoring is appropriate where:

- the success or failure of the measures will take longer to assess – such as for some habitat creation/ management measures
- the mitigation is relevant to a feature upon which the effects may vary during the life of the project.

6.30 It is important that there is an agreed robust feedback mechanism to ensure that where objectives have not been met, provision is made for remedial measures and these are implemented.

6.31 Ideally the results of monitoring should be widely shared, to inform the design of mitigation, compensation and enhancement measures of other projects.

7 CONSEQUENCES FOR DECISION-MAKING

Introduction

7.1 The competent authority determines whether the mitigated project:

- complies with legal requirements e.g. for protected species
- meets national and local policy goals and objectives
- requires conditions and legal obligations attached to the consent concerning detailed design, implementation and monitoring of the project.

7.2 The scoping stage presents the first opportunity to make explicit the legal and policy context. Everyone engaged in the process should be fully aware of, and constantly referring back to, the legal and policy context that applies to the area and issues being studied, and the context of the case. Failure to take account of the legal and policy context, and to provide sufficient information to comply with this, may lead to delay and can result in an application being refused or a decision challenged.

7.3 The consequences, in terms of development control/management, will depend on the importance of the ecological features and the significance of effects upon them and the relevant legislation, policy, and guidance.

Legal Implications

7.4 The legal implications arising out of an EcIA should be made explicit and legal advice sought as necessary. Where an EcIA is undertaken to inform an EIA, it is subject to the relevant EIA Regulations.

7.5 The findings of an EcIA are a material consideration in the planning process and other consent regimes. The competent authority must be provided with all the information needed to assess and evaluate the likely significant environmental effects of a project. The competent authority has the duty to consider the environmental information before it reaches a decision regarding the granting of consent. Key aspects of the EcIA report that the competent authority should take into account when determining an application include[118]:

- the soundness of technical content of ecological information including
    - adequate and up-to-date data
    - ecological methods in accordance with good practice
    - departures from good practice made clear
- whether ecological features are likely to be affected and all potential impacts are described adequately
- whether effects are significant and, if so, are capable of being mitigated
- whether the mitigation hierarchy has been applied
- whether it is adequately demonstrated that the proposal will deliver stated outcomes, with regard to likely effectiveness and certainty over deliverability
- whether the measures are capable of being secured through appropriate planning conditions and/or obligations, and/or are likely to be permitted through other consent regimes e.g. licences for Protected Species
- whether the proposals are compliant with statutory obligations and policy
- whether there is clear indication of likely significant losses and gains for biodiversity
- whether any material considerations have been identified that might require changes to the application.

7.6 When determining a planning application, the competent authority should not adopt a 'wait and see' approach. It should not impose a condition requiring further work to identify the likely environmental effects after permission has been granted. It is a well-established principle that the planning authority should ensure it takes account of all material considerations before making its decision (and does not take account of immaterial considerations not relevant to planning). It is therefore crucial that all information about the potentially significant ecological effects of the proposal is available to the planning authority before it grants permission.

7.7 Where the competent authority considers that the information is insufficient it can request further information or evidence to verify the information already provided. Working closely with the decision-maker, statutory bodies and other consultees during the assessment process should help reduce the likelihood of the competent authority needing to do this.

7.8 In the event that uncertainty cannot be resolved, a compelling case may remain for taking forward a project. In these circumstances, a decision has to be taken in the knowledge that there is uncertainty. In such cases, adaptive management, linked to a bespoke monitoring programme, is recommended as a way of ensuring that any negative impacts or effects are addressed in the course of the development and during the subsequent operational phase. This process depends upon ongoing engagement by the statutory bodies and upon regular reporting by the developer and their consultants.

Policy Implications

7.9 All parties engaged in EcIA should be familiar with the national and local policies that are relevant to a project. Key national policy documents that should be considered during EcIA can be found on government websites and local policy documents are usually available on local authority websites.

7.10 If the project being assessed has emerged from the process of preparing a development plan for which a Sustainability Appraisal (SA) or Strategic Environmental assessment (SEA) has been undertaken, the results of the SA/SEA may be relevant to the EcIA. SA/SEA requires the explicit consideration of alternatives to the project, biodiversity objectives and outcomes. These results should be taken into account along with any mitigation measures, recommendations and monitoring.

Implications for Detailed Design and Implementation

7.11 Conditions, planning obligations and legal agreements are often needed to secure and enforce the implementation of mitigation, compensation and enhancement measures outlined in an EcIA. These obligations can be enforced by the competent authority. This can be particularly challenging when the obligations were developed with one organisation but a different organisation implements the consent.

7.12 All parties should understand the actions they need to take during the implementation stages of a project. This will mean identifying and designing in detail the measures necessary to avoid, mitigate and compensate negative effects, and any measures necessary to achieve enhancements. Details of these measures will be set out in the EcIA and may be presented in an Environmental Management Plan (EMP) or similar document.

7.13 The project proposer should demonstrate commitment to the package of mitigation, compensation and enhancement measures. This is most effectively done by proposing to enter into a legally enforceable agreement, such as, in England and Wales, a planning obligation under section 106 of the Town and Country Planning Act 1990, consent /permit conditions in Ireland and/or its equivalent provision elsewhere. It would normally be between the proposer / developer / landowner and the planning authority, with input from the professional ecologist working on the project. The relevant instrument can include specific obligations which may be set out in detail in a schedule, and may take the form of a Mitigation, Compensation and Monitoring Agreement (MCMA) in the UK or a Monitoring Programme/Plan in Ireland. This should include a detailed explanation of what is to be done, how it will be achieved, where and when it is to be carried out, and who is responsible for ensuring that works are undertaken as proposed. The information provided should include:

- summary of the impacts to be addressed, with clear description of whether they will be dealt with by mitigation measures or compensation measures, and explicit reference to supporting data to ensure an audit trail
- details of how the proposed measures will be funded
- location and extent of the proposed measures on scale plans
- a timetable for implementation of design options and integration with phases of development e.g. construction, operation, habitation, decommissioning, restoration

- expertise of persons responsible for implementing design options
- availability and security of land to implement the design options
- a description of all other resources required to implement the design options
- a statement of how design options will be secured within the planning process or consent process
- details of proposed liaison with local experts and how local people can contribute ideas
- supervision during works by an Ecological Clerk of Works or Project Ecologist
- a monitoring scheme to evaluate the success of mitigation measures and/or compensation measures
- remedial measures in the event that mitigation measures and/or compensation measures are unsuccessful or there are unforeseen effects
- proposed auditing/reporting and publication procedures.

7.14 Good practice in major or novel development projects (e.g. port developments) has seen the development of 'Regulators Groups / Committees' that meet at intervals to discuss progress and the outcomes of monitoring that has been undertaken. This sort of arrangement is best suited to major projects that take place over several years. It could be adapted to smaller projects to ensure that there is a formal completion to the project and to the delivery of compensation, mitigation and monitoring associated with the project. Regulator groups are particularly useful for overseeing adaptive management (see 7.8).

7.15 A clear audit trail should be maintained by both the project proposer and the competent authority in relation to the rationale and timescale for mitigation, compensation and enhancement measures and their delivery and monitoring. This is particularly important where the final project is completed by a successor body inheriting these responsibilities.

APPENDIX 1

Example Assessment of the Significance of Effects: Impacts of road widening on a population of Cetti's warblers

Note: The worked example provided below, whilst intended to be as realistic as possible, is fictitious and for illustrative purposes only. Its aim is to show the general principles of how the approach to EcIA recommended in these Guidelines might be applied in practice. The actual values of various parameters and the conclusions reached could differ in a real situation; other parameters could be relevant and other research findings brought to bear.

The scheme proposals and key biophysical changes

The hypothetical road scheme involves widening a 3 km stretch of two-lane road (c. 9.3 m wide) into a dual carriageway with hard strips (final hard surface increase to c. 19.1 m). This scheme is being implemented largely to take traffic out of the centre of a country town. The widening will require the removal of improved grassland in this location. The scheme is located within the county of Cymrent in the west of Britain and is aligned north-south. Once commissioned, the scheme would permit an almost three-fold increase in traffic volume from 9,500 to an estimated 28,000 vehicles per day and an increase in average speed from 80 kph to 100 kph (c. 50 mph to 60 mph). Site clearance would occur over a six week period, and it is intended to complete the construction works within eight months.

Description of ecological features

- The feature being assessed is a local population of five breeding pairs of *Cetti's warblers Cettia cetti.*

- Approximately 50 m to the east of the A road is a 25.5 ha County Wildlife Site (CWS) called 'The Cuts', which runs parallel to the A road for some 400 m and some 640 m away from it to the east. 'The Cuts' supports five pairs of Cetti's warblers (as well as a diverse range of other species including whitethroat, willow warbler in notable numbers and occasional uncommon migrants, which are not considered further here but which might experience similar impacts to the Cetti's warblers). 'The Cuts' comprises six marshy grassland fields, demarcated by ditches and hedgerows on low bunds. These hedges consist of dense stands of blackthorn, bramble, common alder and grey and goat willow. Common nettle and great hairy willow-herb occur densely adjacent to the bunds. There is a 0.5 ha area of open water and a 1.5 ha reedbed at the centre of one field, but due to natural succession this zone is rapidly being invaded by scrub. The territories of the Cetti's warblers are localised along the bunds, extending typically for lengths of up to 400 – 500 m (in four of the five cases along two or three sides of a field) the birds defending areas of hedgerow, ditch and tall marshland up to c. 20 m either side of the mid-point of the bunds. This average territory size is in keeping with that found in other sites in Britain, though there is high variability (see Snow and Perrins 2000). According to the local Wildlife Trust, territories extend neither into the easternmost c. 150 m of 'The Cuts', where the ditches are dry due to the over-abstraction from local watercourses and boreholes for agriculture, nor into the westernmost 100 m or so (nearest the existing road).

- The Cetti's warbler was unknown in the Britain until 1961. Breeding was first recorded in Kent in the early 1970s. This is a species on the northern edge of its European range that is expanding fairly rapidly in population size and geographical extent (northwards) in response to the recent series of relatively mild winters. It is thought susceptible to very cold winter weather and its population in the mid-eastern counties of England was eradicated by some of the cold winters in the 1980s. The current population size is estimated at over 850 breeding pairs (based on numbers of singing males in 2002), two thirds of this population being in the south-eastern counties of England. Wales was colonised from 1980. The population in Cymrent has been estimated at 50 pairs (singing males).

- Male Cetti's warblers advertise territory with loud song sung from deep cover. Recent research has shown that these songs are highly individual and that recognition of specific neighbours occurs.

- 'The Cuts' is accessed by a footpath usable by the landowner and permit-holding members of the local Wildlife Trust and there is a bird watching hide near the reedbed.

- Habitat throughout 'The Cuts' is still largely in overall 'good' condition for the species, but water supply to the marshy grassland has been steadily diminishing, mainly as a result of increasing agricultural abstraction to the east combined with a climatic pattern of dry summers. Associated with this change, some willow encroachment is occurring and beginning to shade out the reedbed and open water habitat. This steady reduction in water table has also been associated with reports of diminished insect abundance by the local Wildlife Trust which monitors the site, especially in the eastern parts of the site where the ditches have in places dried up.

- On the other side of the road to 'The Cuts', but 500 m from it to the west, is a larger area of similar wetland, which supports a further three pairs of Cetti's warblers; this is on private land with no public access.

Legal and policy framework

- Cetti's warbler is a species listed on Annex II of the Berne Convention and Schedule 1 of the Wildlife and Countryside Act 1981 (as amended). Legal protection in Britain prohibits killing, injury, damage/destruction of nests, and disturbance of adults/young while a nest is in use or being built. Cetti's warbler is not listed on Annex 1 of the Birds Directive and is considered a 'green list' species (status secure) by the RSPB.

- Cetti's warbler is on the statutory nature conservation bodies 'sensitive species trigger list'.

- Despite this 'secure status' nationally, the Cymrent Local BAP requires the maintenance at favourable conservation status of all existing viable areas of habitat for Cetti's warbler. The Local BAP also prescribes the creation of a further 50 ha of habitat for Cetti's warbler in the County. The Local Development Framework requires that care is taken not to negatively affect wetlands of ecological value.

- Sections 238(1) and 246(1) of the Highways Act 1980 gives a Highway Authority the power to:

  'Acquire land, compulsorily or by agreement, for the purpose of mitigating any negative effect which the existence or use of a highway constructed or improved by a Highway Authority has or will have on the surroundings of the highway.'

- Mitigation under these powers, however, does not include compulsory land purchase for the purposes of net ecological enhancement. Highways Authorities also have the duties of ensuring the wise spending of public money and that roads are safe.

Factors on which the Cetti's warbler population depends

- Continuity of physical habitat: many areas of suitable habitat have been lost through conversion to intensive agriculture, infill for development, and dumping.

- Appropriate water supply: many areas of suitable habitat have been lost indirectly through changes in water status, including reduced water supply and water quality. Eutrophication through leaching and run-off from fertiliser applied to agricultural land can lead to increased growth and dominance of vigorous plant species that can then lead to a loss of biodiversity and may also cause reed death.

- Appropriate management: lack of, or inappropriate management of fens and reedbeds, can lead to drying, scrub encroachment and succession to woodland.

- Control of disturbance: Cetti's warbler is a songbird and hence likely to be affected by traffic noise. In the absence of species-specific data it is assumed that Cetti's warbler response to road noise is an average for passerines (see below).

- Genetic interchange with other populations: this is necessary to avoid extinction through inbreeding depression in a small population.

Importance of Cetti's warbler population

- At the time of study the British population is estimated at over 850 pairs and the Cymrent population at over 50 pairs. Thus, five pairs represent 10% of the county population in this example. The recent series of mild winters has facilitated a great increase in population of this species as well as an expansion of its range northwards and westwards into Wales. However, this is still an uncommon breeding bird species, dependent on a vulnerable wetland habitat type and a species that is very susceptible to the effects of any potential cold winters. Taken together, these factors suggest that the local population of Cetti's warblers in 'The Cuts' is at least of County Importance for biodiversity.

- 'The Cuts' is deemed by members of the local Wildlife Trust to be one of the best sites in Cymrent to hear and see Cetti's warblers, and the site also attracts a number of other interesting species on passage migration. The site is therefore considered to be of County importance for social/community value.

Ecological Impact Assessment

- It has been shown in this case (for simplicity) that the hydrology of 'The Cuts' would not be directly or indirectly affected by the dualling of the road. There would be no direct physical impact on the marshy fields or habitat of the Cetti's warblers through the works or any associated ancillary works. The potential negative effects on the Cetti's warblers to be considered then are those that would result from increased disturbance levels during construction and operation and the increased risk of killing birds and isolation of birds during operation.

Construction impacts: site clearance during the breeding season

Proposed activity, duration of activity, biophysical change and relevance to the feature in terms of ecosystem structure and function

Site clearance and construction activities would result in increased noise over eight months. Ambient noise level increases would be variable, but at times there could be considerable increases in noise levels. This would change the noise environment within and near bird territories, creating the potential for impact on the audibility of territorial song and an increase in general stress levels, and hence negative effects on the ability of birds to hold territories and breed successfully.

Characterisation of unmitigated impact on the feature

If works were to take place within the breeding season, there would be a negative impact, probably extending c. 500 m from the road and affecting the whole Cetti's warbler population of 'The Cuts'.
It is not possible to quantify the magnitude of effect from the available literature. The effect of the construction noise would last longer than the duration of the noise and should be considered effectively permanent through the construction period. The duration of effect would be just one breeding season, but abandonment could be permanent for some individuals. Nevertheless, the effect is likely to be reversible in time, once construction was over.

Rationale for prediction of effect

The effects of such variable noise disturbance on breeding of both Cetti's warblers in particular, and birds in general, at different distances from the source of disturbance, are very little understood. Even though the Cetti's warbler song is particularly loud, clarity or individual recognition ability might be lost against background noise. It is also possible that construction noise might cause increased general stress (Reijnen et al. 2002), if not site abandonment. Cetti's warbler is very susceptible to cold weather and a small population could be wiped out in a severe winter especially if already 'stressed'. On a precautionary basis, it is considered likely that this temporary impact could negatively affect the conservation status of the local population.

Effect without mitigation

A significant negative effect at the County scale is concluded. The Cetti's warbler is listed on Schedule 1 of the Wildlife and Countryside Act 1981 and hence protected from disturbance whilst breeding. The potential therefore exists for a breach of relevant legislation.

Mitigation

Construction works in the stretch should avoid the breeding season as far as possible. If this were not possible, then the only practicable means of reducing the noise would be the installation of a permanent sound barrier in advance of construction works.

Significance of effects of residual impacts after mitigation

Any effect of construction outside the breeding season would not be significant. With the sound barrier, any effect of construction noise would be unlikely to be significant.

Operational impacts 1: increased background noise due to increased traffic volume and speed

Proposed activity, duration of activity, biophysical change and relevance to the feature in terms of ecosystem structure and function

Increased traffic volume and speeds in perpetuity would lead to a permanent increase in ambient noise levels, which would penetrate further into the Cetti's warbler habitat. This would have a potential impact on audibility of territorial song and hence ability of birds to hold territories and breed successfully. This impact, combined with increased background visual sources of potential disturbance (car lights and movement), could increase general stress levels. Such impacts can extend for several hundreds of metres from a road (see Reijnen et al. 1995).

Characterisation of unmitigated impact on the feature

The result of such changes, if unmitigated, would be a negative effect on the Cetti's warbler population in 'The Cuts'. Its extent would encompass all currently viable breeding habitat for the Cetti's warbler in 'The Cuts'. The effect would be effectively permanent and not reversible, as noise would always be affecting the population.

Rationale for prediction of effect

Although not specifically developed in relation to Cetti's warblers in Britain, the best available model for predicting impacts in this case is the guidance developed to predict the effects of road noise on song-birds in Holland including warbler species (Reijnen et al. 1995). The tables in this publication have been used to inform the present example. This Dutch model is considered to be applicable as the road in question meets all of the criteria set by the model. The distance from the road at which no impact on songbirds in fairly open habitat (<30% woodland) generally would be expected to occur with mean traffic speeds of 80 kph (50 mph) and 9,500 vehicles per day, would be around 185 m (Reijnen et al. 1995 Table 2). The local population of Cetti's warblers in 'The Cuts' should accordingly be assumed (on a precautionary basis) to be already somewhat compromised and/or limited by the availability of habitat that is free from road-related disturbance. Such disturbance applies to at least the first 135 or so metres of 'The Cuts' (20%) from the western edge (nearest the road) and might explain the relative lack of sightings of Cetti's warblers reported by the local Wildlife Trust from this band of 'The Cuts'. With the increase in traffic volume to 28,000 vehicles per day and speed to 100 kph (60 mph), this impact distance could increase by over 300%, to at least 565 m (Reijnen et al. 1995 Table 5), that is, 580 m from original A road edge, as the dual carriageway is c. 15 m wider. This predicted impact zone would, therefore, encompass the whole area of 'The Cuts' containing habitat currently suitable for Cetti's warbler. These biophysical changes would decrease the quality of the breeding habitat. The Cetti's warblers might relocate their breeding locations to other parts of 'The Cuts', in which case territories would be smaller and possibly extend into less suitable habitats, negatively affecting fitness. It is likely that it would lead to site abandonment by several pairs (based on the average reductions noted by Reijnen et al. 1995, p.33, loss of at least 2 to 3 pairs is likely). Accordingly, it is considered that the conservation status of Cetti's warbler in 'The Cuts' would be negatively affected.

Effect without mitigation

There will be a significant negative effect at the County scale.

Mitigation

Policy and the legal requirement to avoid intentional or reckless disturbance to a Schedule 1 bird clearly indicate a need to mitigate fully for this impact. Two measures are proposed to achieve this:
(a) The purchase of the land between the road and the wetland and its planting with both a native woodland (willow, poplar and alder) belt c. 50 m in width with dense understorey scrub, extending this some 150 m north and south of 'The Cuts' and in addition, by agreement with the local Wildlife Trust (or by purchase if necessary), the extension of the same planting into the first 50 m of 'The Cuts' from the west. It is likely that this measure would reduce the impact distance on Cetti's warbler compared with an unmitigated scheme (based on an increase in 'wood fraction' to 0.5 to 0.9, see Reijnen et al. 1995 Table 4) to just 230 m from the old A road edge. Design of this woodland belt would need to consider potential impacts on other species e.g. barn owls. Whilst the impact distance after this mitigation would still extend some 95 m further into 'The Cuts' than it did before construction of the dual carriageway, the area of breeding territory away from the road (out of the impact zone) would be greater than this, and the net area of good habitat for Cetti's Warbler should remain the same or increase slightly.

(b) The re-establishment of hydrological conditions that are favoured by Cetti's warbler in the part of 'The Cuts' that is currently too dry and lacking territories. This would be achieved with the agreement of the landowner through the amendment of the provision of a new water supply to the land for the farmer; via legal agreement in perpetuity. This should allow the Cetti's warblers to extend their breeding activity in the 140 m farthest from the road, outside of the predicted noise 'impact distance'.

Accordingly, it is considered that these measures, taken together, would mitigate the loss of quality of much of the Cetti's warbler habitat in 'The Cuts' and hence maintain the conservation status of the population. Note that if agreement could not be obtained from the local Wildlife Trust to plant up the western edge of 'The Cuts', then a similar level of noise reduction would need to be obtained via the installation of an expensive, proprietary, noise barrier along the whole length of 'The Cuts' and 150 m beyond on either side, instead of woodland planting (Reijnen et al. 1995, Table 5.2). Such an installation could well be controversial in landscape terms and would require detailed assessment in this regard as well as ecologically.

Significance of residual effects after mitigation

There would be a short-term, (c. 5 years) negative effect on the Cetti's warbler population, significant at the County scale until maturation of the mitigation measures with respect to habitat. However, in the long-term, it is likely that full mitigation would be achieved and there would be no residual effect of significance on the Cetti's warbler population in 'The Cuts'.

Operational impacts 2: increased barrier effect and collision risk

Proposed activity, duration of activity, biophysical change and relevance to the feature in terms of ecosystem structure and function

The scheme would result in > 50% physical increase in any barrier effect that the road might already be exerting on dispersal of adults and/or post-breeding dispersal of juveniles. This is especially the case given the presence of another known population of Cetti's warblers 500 m west of the A road out with the CWS. There would also be an increase in collision risk due to increased traffic speeds, and perhaps volumes (though increased traffic volumes can actually increase the deterrent for crossing the road and hence actually reduce collision risk).

Characterisation of unmitigated impact on the feature

The biophysical change would exert a permanent negative impact on the whole local population of Cetti's warblers in 'The Cuts' and would be in practical terms irreversible (though compensation would be feasible).

Rationale for prediction of effect

It is considered that the existing A road is already acting to an extent as a deterrent to post-breeding or post-fledging dispersal of some individuals, and this effect might increase with the > 50% increase in width of the barrier and higher vehicular speeds. There are no means of quantifying this possible impact based on existing scientific knowledge. Any reduced dispersal could result in reduced genetic interchange between populations and increase the risk of genetic isolation and inbreeding depression. It is also the case that any individuals dispersing across the road would be exposed to a higher risk of collision with vehicles. This additional risk is also currently unquantifiable, but any adult mortality (or substantial juvenile mortality) in such a small population could notably increase local extinction risk. It is concluded that both the increased barrier effect of the nearby road and the increased collision hazard would negatively affect the conservation status of the Cetti's warblers in 'The Cuts'.

Effect without mitigation

It is considered that there would be a negative effect, significant at the County scale.

Mitigation

The potential impact cannot be confidently mitigated because 'green crossings' over roads are expensive and their likely success in attracting Cetti's warblers to cross safely rather than through the traffic stream is not possible to quantify from previous studies.

Significance of residual effects after mitigation

It is considered that the population of Cetti's warblers in 'The Cuts' will experience a permanent loss of conservation status, which would constitute a significant negative effect at the County scale.

Compensation

Compensation should be feasible by increasing the potential for population growth in other places in Cymrent. The County BAP has identified a strategy to achieve this, which includes the provision of a grant for land-owners to encourage them to manage existing habitats, or create new habitats for Cetti's warblers. An appropriate long term contribution to this grant fund will be made by the Highway Authority. It is likely that the proposed compensation would, in the longer term, increase the chances of success of a county-wide population enhancement strategy, resulting in no significant effect on Cetti's warblers in the county as a whole.

Monitoring

Linked to these mitigation proposals there would be a requirement for monitoring of the success of the mitigation in keeping with legal requirements. It is likely that the Highways Authority in this instance would monitor the growth and maturation of the proposed tree belt and arrange separate monitoring of the Cetti's warbler population, in this case almost certainly through the local Wildlife Trust.

Note that a summary of impacts is given on the following page

References for case study

Reijnen, M.J.S.M., Veenbaas, G. and Foppen, R.P.B. (1995). *Predicting the Effects of Motorway Traffic on Breeding Bird Populations.* Ministry of Transport and Public Works, Directorate General for Public Works and Water Management, Road and Hydraulic Engineering Division; DLO - Institute for Forestry and Nature Research, Rijkswaterstaat.

Reijnen, R., Foppen, R.F., Veenbaas, G. & Bussink, H. (2002). *Disturbance by Traffic as a Threat to Breeding Birds: Valuation of the Effect and Considerations in Planning and Managing Road Corridors.* In: B. Sherwood, D. Cutler and J. Burton (Eds.) *Wildlife and Roads: The Ecological Impact.* Imperial College Press, London.

Snow, D. and Perrins, C. (2000) *The Complete Birds of the Western Palaearctic* on CD-rom. Oxford University Press.

APPENDIX 1 cont'd

Summary of impacts of road widening on a population of Cetti's warblers (a population important within a county context)

Impacts	Characterisation of unmitigated impact on the feature	Effect without mitigation	Mitigation	Significance of effects of residual impacts (after mitigation)
Construction Impacts – site clearance and construction				
Increased noise disturbance	Increased noise disturbance affecting the ability of birds to hold territory if construction took place in the breeding season. There would be a negative impact (variable over the day/ night cycle, but effectively constant) extending up to 500 m from the road and affecting c. 80% of the local population to varying extents over one	Negative effect on breeding success in one season. Possible reduction in population size. Significant negative effect at the County scale. Possibly reversible as construction is only for one season.	*Option 1:* Avoidance of construction in the breeding season. *Option 2:* Construction of permanent sound barrier in advance (see below).	*Option 1:* Negative effect on breeding success is avoided. There is no negative effect on the population or its conservation status *Option 2:* Tried and tested engineering technique. Negative effect on breeding success is avoided. There is no effect on the population
Operational Impacts – increased traffic volume and speed				
Increased noise disturbance	Increased noise disturbance affecting the ability of birds to hold territory. Although there would be some year-round and night to day variation in levels of noise, the overall negative effect would be permanent. The extent would be at least 400 m beyond the current limit of effect of the existing road. This would not be reversible as noise will always be affecting the population without	Permanent negative effect on breeding success. Reduction in population size. Significant negative effect at the County scale.	Combination of woodland buffer planting (or planting plus sound barrier), plus restoration of eastern part of the CWS to support Cetti's warblers.	Negative effect on breeding success. Significant negative effect on County population in the short-term (c. 5 years), Insignificant effect at in the long-term.
Increased barrier to bird movement	Increased barrier to bird movement and collision risk. Permanent impact on dispersal ability due to increased road width, higher vehicular speeds and collisions.	Permanent negative effect on breeding success and bird mortality. Reduction in population size. Significant negative effect at the County scale.	Cannot be readily mitigated.	Negative effect on breeding success and bird mortality at the County scale. Permanent negative effect on the local population. Compensation proposed by long term financial contribution to the provision of grants to land owners for the improvement of habitat for the species within the County. With compensation, effects are not likely to be significant in the long-term at the County scale.

APPENDIX 2

Example Assessment of the Significance of Effects: Offshore Wind Farm

The worked example provided below, whilst intended to be as realistic as possible, is fictitious and for illustrative purposes only. Its aim is to show the general principles of how the approach to EcIA recommended in these Guidelines might be applied in practice. The actual values of various parameters and the conclusions reached could differ in a real situation; other parameters could be relevant and other research findings brought to bear.

The Project

The application considered in this example relates to a project to develop an offshore wind farm with a capacity of approximately 450 MW. In common with many such applications the project takes the form of an envelope i.e. an area of sea and seabed within which the development is proposed. Specific details of the design will be confirmed when and if consent is granted and subject to a more detailed design exercise. Nevertheless, for the purposes of EIA it has been agreed that likely development scenarios will include either 90 x 5 MW turbines or 150 x 3 MW turbines. The latter is more likely as it is unclear that a commercial case can be made for the use of 5 MW turbines. It is also considered that, from an ecological perspective, many smaller turbines represent the worst-case scenario (more disturbance, greater footprint, etc.). On this basis the EcIA is based on the 150-turbine scenario. The 3 MW turbines proposed are likely to have a maximum (to tip of blade) height of no more than 130 m.

Four cables (export cables) will be installed to connect the wind farm to the onshore electricity-generating network.

Scoping Issues for an Offshore Wind Farm

The categories of potential ecological effect arising from offshore wind farms are likely to include:

- Loss of benthic habitat arising from the installation of turbines foundations and scour protection.
- Habitat and species disturbance arising from the installation and operation of export and other cabling.
- Changes to coastal processes resulting in changes to the distribution and composition of sediment types.
- Noise arising from construction activities and to a lesser extent in operation.
- Disturbance from construction activities.
- Disturbance arising from the operation and maintenance of the wind farm.
- Pollution from accidental release of fuels/oils during construction and during operation.
- Effects on migratory species.

Loss of habitat is likely to be restricted to the turbine locations around the masts.

Temporary disturbance would be along the export cable route, which may extend for some distance inshore, including inter-tidal areas. The potential impacts of 1 and 2 would be on benthic habitats, fish spawning and foraging for birds.

Coastal process effects could manifest over a large region – the extent of which may need to be modelled. There is potential for effects to offshore and coastal sediments and these changes could affect benthic habitats and associated species.

Noise from construction vessels can result in disturbance to bird populations and marine mammals within the wind farm and within access routes. Noise, particularly from piling operations, has the potential to cause lethal and sub-lethal effects to fish, marine mammals and birds and these effects can occur over many kilometres.

During operation, maintenance vessels can disturb bird populations and marine mammals within the wind farm and within access routes.

Operational wind farms may cause ongoing disturbance to bird populations, with some species likely to avoid turbine structures. Some species are also at risk of collision with turbine blades. Electromagnetic fields around export cables have the potential to affect elasmobranchs.

There is some risk of pollution during construction from the release of fuels, oils and sediments (during piling) and during operation from the leakage of oil from turbines or off-shore substations.

Setting the baseline

The scope of the EcIA will, therefore, need to include consideration of the effects arising from the construction, operation and decommissioning of the wind farm and its export cables over a typical lifetime of at least 25 years. These effects may impact upon water quality, benthic habitats and species, inter-tidal habitats, fish populations, marine mammals and birds. The zone of influence will vary for each, but will extend from the immediate location of the turbines and export cables (e.g. habitat loss) to areas many kilometres from the wind farm site (e.g. coastal processes and noise) and the baseline will need to reflect this.

Importance of ecological features

Benthic habitat surveys (sidescan sonar and grab sampling) indicate that the wind farm area comprises infralittoral mobile clean sand with sparse fauna (SS.SSa.IFiSa.IMoSa). This biotope comprises medium to fine sandy sediments and typically supports an impoverished fauna. This is a widespread biotope around England that occurs at various locations on the east coast (including Spurn Head and The Wash), the Sussex coast, Start Point (Devon), the Bristol Channel and Morecambe Bay; it is less widely recorded in Scotland, Wales and Ireland. SS.SSa.IFiSa.IMoSa forms part of the Subtidal Sands and Gravel (previously Sublittoral Sands and Gravel) priority habitat listed under the UK Biodiversity Action Plan (BAP).

The surveys indicate that in places SS.SSa.IFiSa.IMoSa grades to SS.SBR.PoR.SspiMx (previously CMX.SspiMx) 'Sabellaria spinulosa on stable circa-littoral mixed sediment'. This biotope is found in the subtidal and lower intertidal/sublittoral fringe and in places S. spinulosa forms biogenic reef structures that support a diverse community of epifauna and infauna. It has a wide but restricted distribution throughout the north-east Atlantic, especially in areas of turbid seawater with high sediment loads. However, records are restricted to the east coast (south of Whitby) and south coast (no further west than Weymouth) of England; it has also been recorded from several locations on the Welsh coast. Biogenic reef is a habitat type listed on Annex I of the EC Habitats Directive and is a priority habitat under the UK BAP. Discussions with relevant experts and SNCO indicate that this biotope is rare within the region where the wind farm is proposed and that the reef is sufficiently extensive to qualify as a SAC (but is not classified as a candidate SAC). Some parts of the area have been proposed for inclusion in the Natura 2000 network.

Boat-based and aerial surveys indicate the presence of 56 species of birds, including lesser black-backed gulls, which were recorded throughout the year. A literature search and discussions with the SNCO indicate that birds recorded within the proposed wind farm area are likely to include breeding birds from a coastal SSSI. The breeding population of lesser black-backed gulls (~400 pairs) is an interest feature of the SSSI.

Feature	Protection	Protection Status	Distribution	Importance
Subtidal features				
SS.SSa.IFiSa.IMoSa	None	BAP priority habitat	Widespread	National
SS.SBR.PoR.SspiMx (Biogenic reef)	Annex 1	cSAC interest feature BAP priority habitat	Very restricted	International
Birds				
Lesser black-backed gulls	General protection under WCA	SSSI interest feature	Common and widespread	National

Ecological Impact assessment

For the purpose of this section, two potential impacts arising from the wind farm example are considered in detail. The first relates to habitat disturbance on the SS.SSa.IFiSa.IMoSa and SS.SBR.PoR.SspiMx biotopes. The second is the operational impact of potential collision mortality on the breeding population of lesser black-backed gulls.

Habitats

Surveys, initially comprising side-scan sonar and grab analysis both conducted over a coarse sampling grid, have confirmed the presence of the SS.SSa.IFiSa.IMoSa biotope and its spatial extent. It is also known, from historical data (> 5 years old) and side scan sonar that biogenic reefs formed by S. spinulosa are present, although the extent and precise location of individual reefs is less well understood.

Construction Impacts 1: direct habitat loss

Proposed activity and its duration, biophysical change and relevance to the feature in terms of ecosystem structure and function

Turbine foundations would be installed within SS.SSa.IFiSa.IMoSa biotope, but not within an area known to support biogenic reef. The construction of turbines is expected, to result in the loss of an area of the SS.SSa.IFiSa.IMoSa biotope beneath turbine foundations and the associated scour protection. However, the area affected is not considered likely to significantly damage the ecosystem structure and function.

Characterisation of unmitigated impact on the feature

Habitat loss arising from the installation of turbine foundations is likely to be restricted to the immediate area of the foundation pile and scour protection (comprising rock armour). The habitat loss associated within each turbine is unlikely to extend over more than 300 m^2. As 150 turbines are proposed, the total area affected is unlikely to exceed 4.5 ha. (Out of a total wind farm area of 12,000 ha). Habitat loss is a long-term effect, it will persist until the turbine structures are removed (a 25 year operational lifetime is predicted for the wind farm).

Rationale for prediction of effect

As sublittoral sands and gravels are widespread both within the proposed wind farm area and more widely within Britain, the extent of habitat loss arising from this wind farm construction is considered to be very small.

Effects without mitigation

Although the effect of habitat loss arising from turbine construction is long term (at least 25 years), a significant negative effect is not predicted due to the very small proportion of this habitat affected.

Mitigation

Although a significant effect is not predicted it is considered good practice to limit the extent of habitat loss arising from construction.

Significance of effects of residual impacts after mitigation

The habitat loss arising from turbine construction will not be significant.

Construction impacts 2: habitat disturbance (abrasion and physical damage)

Proposed activity and its duration, biophysical change and relevance to the feature in terms of ecosystem structure and function

The operation of, and activities associated with, jack-up barges used in turbine erection and the installation of inter-array electrical cables during construction have the potential to cause disturbance to habitats. The use of high pressure water jets to assist in the burial of inter-array cables is known to cause the temporary liberation of sediments, which may disperse over nearby areas of habitat causing smothering. The extent of 'jetting' is not known in advance, but previous experience shows that it tends to be only occasionally required. adjacent to turbine foundations. In light of the extent of similar habitat recolonisation, recovery is, however, likely to be rapid and any effect will be fully reversible in the short-term.

Four cables are proposed, which will be installed sequentially. These export cables from the wind farm will pass through an area where biogenic reefs are known to form. The preferred installation method, ploughing, has the potential to cause direct structural damage to the reefs.

Characterisation of unmitigated impact on the feature

The extent of any effect arising from construction of the wind farm turbines is not known, but it is expected that disturbance will be restricted to localised damage and abrasion of benthic fauna in the area immediately adjacent to turbine foundations. In light of the extent of similar habitat recolonisation, recovery is, however, likely to be rapid and any effect will be fully reversible in the short-term.

The extent of any sediment plume arising from jetting activities is unlikely to extend over more than several hundred square metres and is expected to persist for a timeframe measured in hours rather than days.

The disturbance to the habitat from installing the four proposed export cables will, based on previous experience, be restricted to a corridor of no more than 40 m (10 m maximum per cable). Approximately 1 km of the cable route passes through an area known to support the SS.SBR.PoR.SspiMx community, although the extent of biogenic reef within this area is unknown. Installation of the cables will cause damage to any biogenic reef present. Based on experience in similar developments, these effects are probably reversible but only in the long-term with localised damage expected to persist for several years.

Rationale for prediction of effect

The following are extracts from the Habitat Action Plan (HAP) for Subtidal Sands and Gravel (http://jncc.defra.gov.uk/pdf/UKBAP_BAPHabitats-54-SubtidalSandsGravels.pdf):

> *'Sand and gravel habitats are subjected to a variety of anthropogenic factors including the influence of pollutants in riverine discharge and physical disturbance by fishing and aggregate dredging activities. The latter two factors probably have the greatest influence on the organisms that inhabit sand and gravel substrata...*
>
> *Many species inhabiting highly perturbed and mobile sediments are relatively unaffected by fishing activities or other anthropogenic physical disturbance. However, large bodied, slow growing fauna such as bivalves are sensitive to fishing disturbances and their populations may be slow to recover. Biogenic reefs and sedentary worm beds may be particularly vulnerable to trawling activity'.*

In summary, the biotope is less sensitive to short-lived mechanical impacts than those arising from repeated disturbance or pollution.

In contrast the SS.SBR.PoR.SspiMx biotope is considerably more sensitive to even small scale physical disturbance. For example, MarLIN (http://www.marlin.ac.uk/biotopes/SS.SBR.PoR.SspiMx.htm) indicates that: *S. spinulosa reefs are particularly affected by dredging or trawling and in heavily dredged or disturbed areas an impoverished community may be left (e.g. SS.SCS.CCS.Pkef) particularly if the activity or disturbance is prolonged. However, it is likely that reefs of S spinulosa can recover quite quickly from short term or intermediate levels of disturbance as found by Vorberg (2000) in the case of disturbance from shrimp fisheries and recovery will be accelerated if some of the reef is left intact following disturbance as this will assist larval settlement of the species.*

On this basis it is considered that the SS.SSa.IFiSa.IMoSa biotope is resilient to disturbance effects of low magnitude and can be expected to recover quickly from direct habitat damage and sediment deposition of the magnitude envisaged here. It is likely that the predicted effects on this community arising from habitat disturbance would be insignificant. Biogenic reefs, however, are considerably more sensitive to disturbance which impacts on their physical structure. It is considered likely that damage to reefs arising from cable installation could negatively affect the conservation status of this feature.

Effects without mitigation

The effects of disturbance arising from the installation of turbines and inter-array cables will be temporary and very limited in their spatial extent. It is anticipated that the community affected by this disturbance will rapidly recover from these disturbance effects. A significant negative effect from turbine installation and inter-array cabling is not, therefore, predicted.

Export cable installation could have a significant negative effect on biogenic reefs at the international level. The physical disturbance caused by the cable installation process is reversible, but only in the long-term. As this is an interest feature of a cSAC, the likelihood of such an effect is sufficient to trigger the requirement for an 'appropriate assessment'.

Mitigation

Although no significant impacts arising from the installation of turbine foundations and inter-array cables have been identified, it is considered good practice to minimise the extent of any unnecessary habitat disturbance. On this basis it is recommended that the extent of jetting used during inter-array cabling is constrained to those areas where it is essential.

A detailed survey of the proposed export cable route which passes through the SS.SBR.PoR.SspiMx community will be undertaken using remote video surveying techniques to identify the location of individual biogenic reefs. The cable route will be modified to avoid these features.

Significance of effects of residual impacts after mitigation

The effects of turbine installation in areas that do not support biogenic reef would not be significant.

The effects of the installation of export cables in areas that do not support biogenic reef would not be significant. If detailed surveys are undertaken and biogenic reefs are avoided during the installation of export cables then the effect of construction disturbance is unlikely to be significant.

Lesser black-backed gulls

Surveys of the proposed wind farm area indicate occasional use of the site during the breeding season by lesser black-backed gulls. A maximum monthly count of 20 individuals was recorded during a two-year programme of boat surveys, and approximately 25% of all observations were recorded at rotor height (assumed to be between 30 – 150 m above sea level).

Operational Impacts: collision mortality

Proposed activity, duration of activity, biophysical change and relevance to the feature in terms of ecosystem structure and function

The installation of wind turbines has the potential to be an additional mortality factor for bird populations due to collision with turbine blades; the risk arises when birds fly within the rotor swept area. The project is for 150 turbines in the vicinity of a breeding colony of lesser black-backed gulls (< 10 km). Any birds of this species observed within the wind farm (particularly during the breeding season) are assumed to form a part of the breeding population that is an interest feature of the adjacent SSSI.

Characterisation of unmitigated impact on the feature

Collision risk modelling (using a method agreed with the SNCO and with appropriately cautious assumptions) indicates that approximately 0.30 – 0.50 birds per year can be expected to collide with turbine blades (it is assumed that any bird colliding with a turbine blade will die). Although there are uncertainties in the collision risk modelling undertaken (including, but not limited to, assumptions about avoidance rates) precautionary assumptions have been agreed with the SNCO and other consultees. In light of these assumptions it is considered that the upper value in this range is the maximum rate of mortality likely to arise during operation.

Rationale for prediction of effect

Without application of methods such as Population Viability Analysis (PVA) it is not known to what extent the breeding population of lesser black-backed gull can sustain additional levels of mortality. It has been agreed, with the SNCO and other consultees, that any impact not increasing adult mortality by more than 1% of the existing background mortality rate can be considered to be insignificant. Wanless et al (1996) indicates that annual adult survival is 93%, which implies a background mortality rate of about 56 birds within a population of 800 (i.e. 400 pairs), therefore, a predicted mortality rate arising from collision of greater than 0.56 birds per year would be considered to be significant.

Effects without mitigation

The predicted annual mortality rate arising from collisions with turbines is less than the threshold agreed with the SNCO and it is therefore predicted that the effect would not be significant at the national (or any other) scale.

Mitigation

No options for mitigation have been identified.

Significance of effects of residual impacts after mitigation

It is likely that there would not be a significant effect on the lesser black-backed gull arising from collision mortality.

Note that a summary of impacts is given below on the following page

References for case study

Vorberg, R. (2000). Effects of shrimp *fisheries on reefs of Sabellaria spinulosa* (Polychaeta). ICES *Journal of Marine Science*, 57, 1416-1420.

Wanless, S., Harris, M.P., Calladine, J. & Rothery, P. (1996). Modelling responses of herring gull and lesser black-backed gull populations to reduction of reproductive output: implications for control measures. *Journal of Applied Ecology*, 33, 1420–1432.

APPENDIX 2 cont'd:

Summary of impacts of an offshore wind farm on marine habitats and lesser black-backed gulls

Habitats				
Activity	**Characterisation of unmitigated impact on the feature**	**Effect without mitigation**	**Mitigation**	**Significance of effects of residual impacts after mitigation**
Construction impacts				
Direct habitat loss	Turbine and scour protection construction will result in the long-term (>25year) loss of approximately 4.5 ha of the SS.SSa.IFiSa.IMoSa biotope.	Habitat loss is considered to be insignificant in the context of the availability of similar habitat within the wider area at all geographical scales.	None required, but it is considered to be good practice to restrict unnecessary habitat loss to a minimum.	No negative effect on the conservation status of this biotope and therefore not significant
Habitat disturbance (abrasion and physical disturbance)	The operation of jack-up barges is expected to cause localised abrasion and damage to benthic fauna (associated with SS.SSa. IFiSa.IMoSa biotope) around turbine structures. Sediment plumes generated by jetting of inter-array cables may cause localised smothering of benthic fauna (associated with SS.SSa.IFiSa. IMoSa biotope). Installation of export cables may cause abrasion and damage of biogenic reef within a 40 m wide corridor.	Habitat disturbance arising from the operation of jack-up barges is considered to be insignificant in the context of the availability of similar habitat within the wider area and the potential for rapid recolonisation of affected areas at all geographical scales. Smothering arising from jetting operations is considered to be insignificant in the context of the availability of similar habitat within the wider area and the potential for rapid recolonisation of affected areas at all geographical scales. A significant negative effect on biogenic reefs, arising from export cable installation, at the international level is probable.	None required for disturbance arising within the wind farm, but it is considered to be good practice to restrict unnecessary habitat disturbance to a minimum. A detailed survey of the proposed export cable route which passes through the SS.SBR.PoR. SspiMx community will be undertaken using remote video surveying techniques to identify the location of individual biogenic reefs. The cable route will be modified to avoid these features.	The effects of turbine installation in areas that do not support biogenic reef would not be significant. The effects of the installation of export cables in areas that do not support biogenic reef would not be significant. If detailed surveys are undertaken and biogenic reefs are avoided during the installation of export cables then the effect of construction disturbance is unlikely to be significant.
Birds				
Activity	Characterisation of unmitigated impact on the feature	Effect without mitigation	Mitigation	Significance of effects of residual impacts after mitigation
Operational impacts				
Collision mortality	Collision risk modelling indicates that the operation of the wind farm will result in an increase in mortality within the lesser black-backed gull population of approximately 0.30-0.50 birds per year.	The predicted annual mortality rate arising from collisions with turbines is less than the threshold agreed with the SNCO and it is predicted that the effects would not be significant at the national (or any other) scale.	No options for mitigation have been identified.	It is likely that there would not be a significant effect on the lesser blacked-backed gull arising from collision mortality at any geographical scale.

APPENDIX 3

Template for Ecological Impact Assessment (EcIA)

***(Extract from** CIEEM's Guidelines for Ecological Report Writing)*

This template should be used in accordance with the recommendations presented in CIEEM's *Guidelines for Ecological Report Writing*[119]. The template is intended to provide a logical and reasonable structure for those preparing Ecological Impact Assessment reports that will be submitted in support of a planning application. The template should be used to guide the topics and content to be included in such a report.

For assessments which clearly relate to a single species or species group (such as assessments relating to bats in a proposed barn conversion) it will be appropriate to simplify the report structure by combining sections or deleting headings for sections which are not needed (for example, cumulative effects or compensation may not be required in some cases, particularly for very small scale projects). However, whilst it may be appropriate to simplify the structure of the report, it is likely that the contents set out below will be relevant for schemes of any scale, and any major departures from this approach should therefore be clearly justified.

Note: this template may need to be adapted for use in relation to an EcIA Report for a project in the marine environment.

Section	Content
B1. Cover page	Report title. Date of report. Name and contact details of principal author. Name of individual/organisation who commissioned the report. Unique reference number so that the report can be referred to, including version number.
B2. Quality Assurance	Details of QA protocol
B3. Contents table	Provide page numbers for each section (and possibly also sub-sections), as well as figures, tables and appendices.
B4. Summary	A one page summary of: • Purpose of the report • Description of the scheme • Methodology / methods • Key impacts and mitigation measures • Conclusions Consider also use of a finalised Ecological Constraints and Opportunities Plan (ECOP) as specified in BS42020 clause 5.4 as a graphical means of presenting key information.

Section	Content
B5. Introduction	Name and qualifications and competence of principal author. Name of individual/organisation who commissioned the report. Purpose of the report. Site name. Brief description of the site. Reference to a plan showing the site boundaries with an OS base. A brief description of the project, e.g. an outline planning application for residential development of the site. Reference to any previous reports provided for the site (e.g. a Preliminary Ecological Appraisal Report). Clear statement of the purpose of the report e.g.: • To identify and describe all potentially significant ecological effects associated with the proposed development • To set out the mitigation measures required to ensure compliance with nature conservation legislation and to address any potentially significant ecological effects • To identify how mitigation measures will/could be secured • To provide an assessment of the significance of any residual effects • To identify appropriate enhancement measures • To set out the requirements for post-construction monitoring
B6. Planning policy and legislation (this can be included as a section in the main body of the report or can be included as an appendix)	Provide all key relevant planning policies (national and local). List all relevant legislation. It is important that this section is scheme-specific. Where a piece of legislation is relevant, explain why (i.e. which protected species are present).
B7. Methodology/ Methods B7.1 Scope of the assessment	Describe the scope of the assessment, including: • A description of the Zone of Influence • List the types of features considered, e.g. designated sites, habitats and species of principal importance for conservation of biodiversity, protected species, etc. • Describe any consultation that has taken place in relation to determining the scope of the assessment
B7. Methodology/ Methods B7.2 Desk study	List the individuals or organisations that have been contacted. List the websites that have been used to search for relevant data. Describe the information that has been requested/searched for. Describe the study area (likely to vary in relation to different resources). State when data searches were carried out. List any ecological reports that have been reviewed, such as previous reports for the same site, or reports for adjacent sites (appropriately referenced).

Section	Content
B7. Methodology/methods B7.3 Field survey	For each field survey undertaken provide: • Brief description of methodology/method • Names and qualifications of surveyors • Date(s) of surveys • Study area • Weather conditions at time of survey(s) and time of day (if relevant) • Reference to relevant guidance document (where appropriate) • Explanation of any departures from recommended guidance • Limitations Note: Where multiple survey visits have been undertaken, dates, times and weather conditions of surveys can be provided in a table in an appendix. Note: Detailed descriptions of survey method can be provided in an appendix. Note: Where the field survey was an 'extended Phase 1 habitat survey' (or the equivalent in Ireland), it is important to explain what was done in addition to the standard Phase 1 habitat survey or equivalent in Ireland, such as an assessment of the likely value of the hedgerows for dormice, or identification of any buildings or trees suitable for use by roosting bats, etc.
B7. Methodology/methods B7.4 Assessment	Describe the assessment methodology/method used. In particular: • How has significance been determined. • What geographical contexts are used, and how have these been determined. • State which years have been assumed for the assessment of impacts (and for which baseline conditions have been described).
B8. Baseline ecological conditions (General)	Provide a clear description of the baseline conditions for all features. This should be based on the conditions at the time that the activity giving rise to an impact occurs, assuming the absence of the development. In some cases this may require consideration of the baseline conditions in multiple years (for example, to account for operational phase impacts). Include a statement of the geographical contexts within which each feature is considered to be important. Provide a summary table listing all of the relevant features and the geographical context within which each is considered to be important.
B8. Baseline ecological conditions B8.1 Designated sites	Provide details of all designated sites of relevance (or possible relevance) to the assessment, including name, level of designation, location relative to the site, and reasons for designation. In some cases it will be relevant to include a plan showing the location of designated sites.
B8. Baseline ecological conditions B8.2 Habitats	Provide a description of the habitat types present within the site and on immediately adjacent land. Focus should be given to habitat types identified as being of national or local importance for the conservation of biodiversity. This should make reference to a habitat map of the site, normally drawn in accordance with Phase 1 habitat survey methodology (or equivalent in Ireland). However, it should be noted that the habitat categories used by the Phase 1 habitat survey methodology do not mirror the habitat types considered to be conservation priorities, and further details will therefore need to be provided in some cases. The description should include all relevant information, such as dominant plant species present, notable plant species, and current management.

Section	Content
B8. Baseline ecological conditions B8.3 Species and species groups **Note** This can be sub-headed as follows, for example: i. Plants ii. Invertebrates iii. Amphibians iv. Reptiles v. Cirl buntings vi. Other birds vii. Bats viii. Badgers ix. Other mammals	Provide a description of the use of the site (or likely use of the site) by important species (national or local conservation priorities, or protected species). This should be based on a combination of desk study information, field survey data, and an assessment of the likely value of the habitats for each species present. The description for each species/group should combine the information provided from the various data sources, rather than including desk study and field survey information for the same species/group in different parts of the report. The detailed results of field surveys should be presented on plans (for some sites they can be included on the Phase 1 habitat map or the equivalent in Ireland) and/or in appendices. In some cases it will be appropriate to group species together into species groups to avoid repetition.
B9. Description of the proposed development	Provide a detailed description of the proposals with reference to appropriate drawings. Include a description of how the scheme has been designed to avoid/minimise ecological effects, if relevant.
B10. Assessment of effects and mitigation measures **Note:** This can be sub-headed as follows, for example: B.10.1 Reptiles • Potential impacts • Mitigation measures • Significance of residual effects Note: Potential impacts can be divided into different phases, but the significance of residual effects should relate to the project as a whole (i.e. all phases combined)	Identify and describe all of the potential impacts of the proposed development on each feature identified in the 'Baseline Conditions' section, including impacts associated with all phases (construction, operation, restoration, de-commissioning, etc). • Where no impact on a particular feature is predicted a clear statement to this effect should be provided with appropriate justification. • It is important that this section follows the same sub-headings as the Baseline Conditions section to enable the reader to see how the impacts on each feature present has been assessed Identify and describe the mitigation measures required and a clear statement of how these can be secured. Refer to the evidence base, if any, for these mitigation measures. Provide an assessment of the significance of any residual effects. This should comprise a description of the effect and a statement of the geographic level at which the effect is likely to be significant (e.g. Significant at the national level, Significant at the county level, Not significant, etc). The assessment must include a robust justification for the assessment, based on information clearly presented in the report. In many cases, this is likely to require reference to be made to appropriate publications. Provide a summary table listing the significance of residual effects for each feature, the mitigation measures required and the means by which mitigation measures can be secured to allow the local planning authority to ensure that appropriate planning conditions / obligations are included with any consent.
B.11 Cumulative effects **Note:** This can be included within the 'Assessment of effects and mitigation measures' or dealt with as a separate section	Identify any other projects which could give rise to a significant cumulative effect. Describe and assess any potential cumulative effects and determine whether they would be significant or not (and in which geographical context). Provide a robust justification for the conclusions reached.
B12. Compensation (if relevant)	Where compensation measures are considered necessary to off-set significant residual effects these should be described and assessed. Refer to the evidence base, if any, for these compensation measures.

Section	Content
B13. Enhancement	Provide a description of the enhancement measures proposed, over and above any mitigation required, and how these could be secured.
B14. Monitoring	Identify and describe any monitoring surveys required, including details of methods and timing, where appropriate.
B15. Conclusions	Draw conclusions on the overall ecological effects of the scheme, justifying how the project accords with relevant legislation and planning policy. Demonstrate compliance with or deviation from relevant development plan policies and statutory obligations. Identify mechanisms to secure commitment to and delivery of recommended measures e.g. through planning conditions and/or through EPS licences. Explain clearly what the likely outcomes are for biodiversity if the proposed development is granted planning permission. Such implications may be presented as a table and/or as a statement of 'net losses and gains' and should provide the decision-maker with a clear understanding of the likely consequence for habitats and species likely to be affected significantly by the proposals.
B16. References	All documents referred to in the text should be listed and appropriately referenced.
B17. Figures	Provide a plan showing the features referred to in the report (normally based on a Phase 1 habitat map or the equivalent in Ireland). It may be appropriate to provide other plans/figures to show the locations of specific ecological features referred to in the report. It can be helpful to overlay the scheme layout or parameter plans with the ecological features.
B18. Appendices	Provide detailed survey methodologies and results in appendices. Site photographs can also be provided in an appendix.

APPENDIX 4

Sources of Contextual Information

The following list provides some sources of information that may be useful when undertaking an Ecological Impact Assessment.

ALERC Association of Local Environmental Record Centres (UK)[120]
Ancient Woodland Inventory[121]
Biodiversity Strategies/Action Plans – national[122]
Biodiversity Strategies/Action Plans – local[123]
British Trust for Ornithology[124], BirdWatch Ireland[125] (Wetland Bird Survey (WeBS) or I-WeBS data)
Centre for Environmental Data and Recording (CEDaR) (Northern Ireland)[126]
CORINE LandCover 2006 raster data (UK and Ireland)[127]
Ecosystems Knowledge Network[128]
Environmental Protection Agency (EPA), including Geoportal Site (Ireland)[129]
European Nature Information System (EUNIS)[130]
Integrated Biodiversity Assessment Tool (IBAT)[131]
International Council for Exploration of the Sea (ICES) data portal[132]
Joint Nature Conservation Committee (JNCC) Protected Sites (UK)[133]
Land Cover Map 2000 (LCM2000) (UK)[134]
LANDMAP (Wales)[135]
Living Landscape (UK)[136]
Local Records Centres Wales[137]
The Marine Life Information Network (MarLIN)[138]
Marine Scotland Information[139]
Multi-Agency Geographical Information for the Countryside (MAGIC) (Great Britain)[140]
National Biodiversity Data Centre (Ireland)[141]
National Biodiversity Network (NBN) (UK)[142]
National Museums Northern Ireland Habitats[143]
National Parks and Wildlife Service (Ireland)[144]
National Planning Policy and Planning Guidance[145]
Natural Areas (England)[146]
Natural Heritage Futures (Scotland)[147]
Northern Ireland Environment Agency[148]
Northern Ireland Landscape Character Areas[149]
Ordnance Survey Ireland[150]
OSPAR list of threatened and/or declining marine species[151]
RSPB Futurescapes (UK)[152]
Scotland's Environment Web[153]
Sitelink (Scotland)[154]
Wales Marine Planning Portal[155]
Wave and Tidal Knowledge Network[156]
Welsh Government and NRW's Geoportal Lle[157]

APPENDIX 5

Habitat Classification Systems

There are a number of different habitat classification systems that may be appropriate for use; these depend upon the geographic location and objectives of the particular study

Some examples of classification systems in regular use include:

Phase 1 Habitat Survey [158] – Appropriate for use across Great Britain, especially suited as a rapid survey tool in semi-natural habitat types in open countryside.

Wetland Typology [159] **–** In Scotland, wetlands can be identified using the Functional Wetland Typology for Scotland.

Integrated Habitat System (IHS) (v2.0) [160] **–** IHS integrates UK broad habitat types, priority habitat types, Annex 1 habitats and JNCC Phase 1 classified habitats, and provides a translation tool between these different classifications. IHS can be used across the UK and Ireland to collect and translate existing habitat data into a common format.

Habitats In Ireland[161] **–** This is the standard habitat classification system for use in Ireland and an associated survey methodology.

National Vegetation Classification (NVC)[162] **–** GB-wide classification and description of plant communities, widely used to describe semi-natural habitats in the UK.

Irish Vegetation Classification (IVC)[163] **–** The IVC is an ongoing project which aims to classify, describe and map in detail all aspects of natural and semi-natural vegetation in Ireland within a single, unified, hierarchical framework. A web application (ERICA) for assigning vegetation samples to the IVC is being developed. The IVC builds on a number of classifications recently developed in a series of NPWS habitat surveys.

European Nature Information System (EUNIS) Habitat Classification[164] **–** The EUNIS includes an EU-wide hierarchical habitat classification which incorporates all Annex 1 habitat types from the Habitats Regulations 1994. EUNIS is widely used across EU states and in the UK, especially marine and coastal areas.

EUNIS (Scotland)[165] **–** SNH has adopted the EUNIS habitat classification for terrestrial habitat data and mapping. It also correlates EUNIS habitats with habitat types listed in Annex I of the Habitats Directive. Correspondence tables support translation between EUNIS and the national habitat classifications and lists, including the NVC, UK BAP Priority Habitat types, Phase 1 categories and habitat features on Sites of Special Scientific Interest (SSSIs).

CORINE Biotopes Project Habitat Classification[166] **–** An inventory of habitats of major importance for nature conservation across the European Community, which forms the basis of the selection of habitats listed in Annex 1 of the Habitats Directive.

UK BAP Broad & Priority Habitats[167] **–** This is a UK-habitat classification prepared by the UK Biodiversity Group that classifies all terrestrial and freshwater habitats in the UK into 37 broad habitat types. UK BAP Priority Habitats are a range of semi-natural habitat types that were identified as being the most threatened and requiring conservation action. The original Priority Habitat list was created between 1995 and 1999 and revised in 2007. The list of Priority Habitats has been used to help draw up statutory lists of habitats of principal importance for the conservation of biodiversity in England, Scotland, Wales and Northern Ireland (see Box 1 for further details). The suite of habitats of principal importance for the conservation of biodiversity (formerly Priority Habitats) nest into the defined Broad Habitat Types.

Identification and mapping of marine, intertidal and coastal habitats is a highly specialised task. A separate survey of these is recommended following published and recognised classification systems. Where the ecologist(s) possess adequate expertise, a preliminary attempt may be made to identify accessible areas of littoral/inter-tidal zone using this classification system.

UK Habitat Classification[168] **–** The UK Habitat Classification potentially presents a unified hierarchical habitat classification suitable for use across the UK territory which integrates with EU and other UK classification systems. The system initially covers terrestrial, freshwater and coastal areas.

GLOSSARY

Adaptive management	Adaptive management is a decision process that promotes flexible decision making that can be adjusted in the face of uncertainties as outcomes from management actions and other events become better understood. Careful monitoring of these outcomes both advances scientific understanding and helps adjust policies or operations as part of an iterative learning process.
Appropriate Assessment	An assessment required by the Habitats Directive where a project (or plan) would be likely to have a significant effect on a European site, either alone or in combination with other plans or projects (part of the Habitats Regulations Assessment process in the UK and the Appropriate Assessment process in Ireland).
Assemblage	A group of species found in the same location.
Avoidance	Prevention of impacts occurring, having regard to predictions about potentially negative environmental effects (e.g. project decisions about site location or design).
Baseline conditions	The conditions that would pertain in the absence of the proposed project at the time that the project would be constructed / operated / decommissioned. The definition of these baseline conditions should be informed by changes arising from other causes (e.g. other consented developments).
Biodiversity	The variability among living organisms from all sources, including terrestrial, marine and other aquatic ecosystems and the ecological complexes of which they are part: this includes diversity within species, between species and of ecosystems.
Biodiversity offsets	Measurable conservation outcomes resulting from actions designed to compensate for unavoidable significant negative effects on biodiversity. The goal of biodiversity offsets is to achieve no net loss, or preferably a net gain, of biodiversity.
Biophysical change	Alteration in biological and/or physical conditions of the environment (e.g. changes in the atmospheric concentration of carbon dioxide, altered soil pH or change in the frequency of a plant species in an area).
Carrying capacity	The maximum number of organisms or amount of biomass that can be supported in a given area or by an ecosystem.
Compensation	Measures taken to offset the loss of, or permanent damage to, ecological features despite mitigation. Any replacement area should be similar in terms of biological features and ecological functions that have been lost or damaged, or with appropriate management have the ability to reproduce the ecological functions and conditions of those biological features. Compensation addresses negative effects which are residual, after avoidance and mitigation have been considered. It is this objective of compensation, and not its location, that distinguishes compensation from 'mitigation'. Depending on circumstances, compensation measures may be located within or outside the project site.
Competent authority	An organisation or individual who is responsible for determining an application for consent for a project. In the context of the UK Habitats Regulations, 'competent authority' has a wider meaning, which includes any Minister, government department, public or statutory undertaker, public body of any description or person holding a public office. Competent authorities in relation to Appropriate Assessment in Ireland are set out in SI 477 of 2011.
Connectivity	A measure of the functional availability of the habitats needed for a particular species to move through a given area. Examples include the flight lines used by bats to travel between roosts and foraging areas or the corridors of appropriate habitat needed by some slow colonising species if they are to spread.
Conservation objective	Objective for the conservation of biodiversity (e.g. specific objective within a management plan or broad objectives of policy).
Conservation status	The state of a species or habitat including for example, extent, abundance, distribution and their trends.
Cumulative impact / effect	Additional changes caused by a proposed development in conjunction with other developments or the combined effect of a set of developments taken together.
Distribution	The geographical presence of a feature. This can depend on factors such as climate and altitude.
Ecological feature	Habitats, species or ecosystems.

Ecological network	An interconnected system of ecological corridors.
Ecosystem	A dynamic complex of plant, animal and micro-organism communities and their non-living environment interacting as a functional unit.
Ecosystem services.	Ecosystem services are the benefits that people derive from the natural environment. The natural environment can be considered as a stock of 'natural capital' from which many benefits flow – social, health-related, cultural or economic.
Effect	Outcome to an ecological feature from an impact. For example, the effects on a dormouse population from loss of a hedgerow. See also 'Impact'.
Enhancement	Improved management of ecological features or provision of new ecological features, resulting in a net benefit to biodiversity, which is unrelated to a negative impact or is 'over and above' that required to mitigate/compensate for an impact.
Environmental Impact Assessment (EIA)	Assessment of projects carried out under the EIA Directive and Regulations.
Environmental (Impact) Statement	A document describing the effects of a project on the environment prepared during EIA. Referred to as 'Environmental Statement' in the UK and 'Environmental Impact Statement' in Ireland.
Favourable condition	Satisfactory condition of an ecological feature. In some cases, favourable condition is specifically defined (e.g. for some designated sites).
Fragility	The degree of sensitivity of habitats, communities and species to environmental change.
Fragmentation	The breaking up of a habitat, ecosystem or land-use type into smaller parcels with a consequent impairment of ecological function.
Geographic scale	The geographic context for evaluation.
Habitat	The place or type of site where an organism or population naturally occurs. Often used in the wider sense referring to major assemblages of plants and animals found together.
Habitat Bank	A biodiversity compensation mechanism that is based on the concept of biodiversity offsets.
Habitats Regulations Assessment	An assessment of projects (or plans) potentially affecting European sites in the UK, required under the Habitats Directive and Regulations.
Impact	Actions resulting in changes to an ecological feature. For example, the construction activities of a development removing a hedgerow. See also 'Effect'.
Important ecological features	Ecological features requiring specific assessment within EcIA. Ecological features can be important for a variety of reasons (e.g. quality and extent of designated sites or habitats, habitat / species rarity).
Local sites	'Non-statutory' sites of nature conservation value that have been identified 'locally' (i.e. excluding SSSIs, ASSIs, NHAs, SPAs, SACs, and Ramsar sites). Local Nature Reserves are included as they are a designation made by the Local Authority rather than statutory country conservation bodies. Local Sites are often called Wildlife Sites, Local Nature Conservation Sites, Sites of Importance for Nature Conservation or other, similar names.
Mitigation	Measures taken to avoid or reduce negative impacts and effects. Measures may include: locating the development and its working areas and access routes away from areas of high ecological interest, fencing off sensitive areas during the construction period, or timing works to avoid sensitive periods. An example of a reduction measure is a reed bed silt trap that is designed to minimise the amount of polluted water running directly into an ecologically important watercourse. Depending on circumstances, mitigation measures may be located within or outside the project site.
Natura Impact Statement / Natura Impact Report	Under the [Irish] European Communities (Birds and Natural Habitats) Regulations 2011 (SI 477 of 2011), an EcIA report including the scientific assessment of a plan (NIR) or project (NIS) in relation to relevant Natura 2000 sites and other information required to enable a competent authority to carry out a Stage 1 Appropriate Assessment.

Net ecological gain	The point at which the quality and quantity of habitats or species improves compared to their original condition i.e. improvements over and above those required for mitigation/ compensation.
No net loss	The outcome resulting from losses being offset by gains.
Population	A collection of individuals (plants or animals), all of the same species and in a defined geographical area.
Precautionary Principle	The principle that the absence of complete information should not preclude precautionary action to mitigate the risk of significant harm to the environment.
Project	In these guidelines 'project' is used to refer to all types of proposals to which EcIA might be applied (e.g. development proposal/scheme or other land use change).
Rarity	A measure of relative abundance.
Replacement	The creation of a habitat that is an acceptable substitute for the habitat which has been lost.
Restoration	The re-establishment of a damaged or degraded system or habitat to a close approximation of its pre-degraded condition.
Scoping	The determination of the extent of an assessment (for an EcIA or full EIA).
Screening	Determination of whether or not an EIA is necessary.
Screening Report	Report containing information to inform Stage 1 of the Appropriate Assessment process (Ireland)
Significant effect	An effect that either supports or undermines biodiversity conservation objectives for 'important ecological features'
Synergistic effect	Occurs when the sum of two effects together is greater than the sum of the effects separately.
Zone(s) of Influence	The area(s) over which ecological features may be affected by the biophysical changes caused by the proposed project and associated activities.

LIST OF ABBREVIATIONS

AA	Appropriate Assessment
CEDaR	Centre for Environmental Data and Recording
CIEEM	Chartered Institute of Ecology and Environmental Management
CWS	County Wildlife Site
EcIA	Ecological Impact Assessment
ECOP	Ecological Constraints and Opportunities Plan
EDS	Ecological Design Strategy
EIA	Environmental Impact Assessment
EMP	Environmental Management Plan
EPA	Environmental Protection Agency
EPS	European Protected Species
HRA	Habitat Regulations Assessment
IEEM	Institute of Ecology and Environmental Management
JNCC	Joint Nature Conservation Committee
LRC	Local Records Centre
MCMA	Mitigation, Compensation and Monitoring Agreement
NGO	Non-Governmental Organisation
NHA	Natural Heritage Area
NIR	Natura Impact Report
NIS	Natura Impact Statement
NPWS	National Parks and Wildlife Service
NRW	Natural Resources Wales
NSIP	Nationally Significant Infrastructure Project
PEA	Preliminary Ecological Appraisal
RDB	Red Data Book
RIES	Reports on the Implications for European Sites
SA	Sustainability Appraisal
SAC	Special Area of Conservation
SEA	Strategic Environmental Assessment
SNCB	Statutory Nature Conservation Body
SNH	Scottish Natural Heritage
SPA	Special Protection Area
SSSI	Site of Special Scientific Interest
SA	Sustainability Appraisal
TEEB	The Economics of Ecosystems and Biodiversity
UKNEA	United Kingdom National Ecosystem Assessment
WFD	Water Framework Directive
WFDA	Water Framework Directive Assessment

ENDNOTES

1 Biodiversity: Code of practice for planning and development (2013) BS 42020:2013
https://shop.bsigroup.com/ProductDetail?pid=000000000030258704

2 Adapted from the definition of Ecological Impact Assessment originally published in Treweek, J (1999) Ecological Impact Assessment, Blackwell

3 The terms 'impact' and 'effect' are explained in the Introduction and Glossary

4 Our life insurance, our natural capital: an EU biodiversity strategy to 2020 (2011)
https://ec.europa.eu/environment/nature/biodiversity/comm2006/pdf/EP_resolution_april2012.pdf

5 The biodiversity strategies and updates for England, Scotland, Wales and Northern Ireland are available from the Joint Nature Conservation Committee (JNCC) website http://jncc.defra.gov.uk/default.aspx?page=5701
The biodiversity strategy for Ireland – Actions for Biodiversity 2011-2016 (2011)
https://www.cbd.int/doc/world/ie/ie-nbsap-v2-en.pdf

6 The Convention on Biological Diversity (1993)
https://www.cbd.int/

7 UK National Ecosystem Assessment and 'Follow-on Phase'
http://uknea.unep-wcmc.org/

8 The Economic and Social Aspects of Biodiversity (2008)
https://www.cbd.int/doc/case-studies/inc/cs-inc-ireland-en.pdf

9 The natural choice: securing the value of nature (2011)
https://www.gov.uk/government/publications/the-natural-choice-securing-the-value-of-nature

10 Towards the Sustainable Management of Wales' Natural Resources (2013)
https://gov.wales/sites/default/files/consultations/2018-01/131029environment-consultation-en.pdf

11 Land Use Strategy for Scotland (2011)
http://www.scotland.gov.uk/Topics/Environment/Countryside/Landusestrategy

12 National Biodiversity Action Plan 2017-2021
https://www.npws.ie/legislation/national-biodiversity-plan
See also National Landscape Strategy for Ireland 2015-2025 (2015)
https://www.chg.gov.ie/app/uploads/2015/07/N-Landscape-Strategy-english-Web.pdf

13 Marine Strategy Framework Directive (2008)
http://ec.europa.eu/environment/marine/eu-coast-and-marine-policy/marine-strategy-framework-directive/index_en.htm

14 UK Marine Policy Statement (2011)
https://www.gov.uk/government/publications/uk-marine-policy-statement

15 Harnessing Our Ocean Wealth - An Integrated Marine Plan for Ireland (2012)
https://oar.marine.ie/handle/10793/810

16 The EIA Directive, amendments, codified version and 2014 review are available from https://ec.europa.eu/environment/eia/eia-legalcontext.htm

17 England – The Town and Country Planning (Environmental Impact assessment) Regulations 2017
http://www.legislation.gov.uk/uksi/2017/571/contents/made
Wales – The Town and Country Planning (Environmental Impact assessment) (Wales) Regulations 2017
http://www.legislation.gov.uk/wsi/2017/567/contents/made
Scotland – The Town and Country Planning (Environmental Impact assessment) (Scotland) Regulations 2017
http://www.legislation.gov.uk/ssi/2017/102/contents/made
Northern Ireland – The Planning (EIA) Regulations (Northern Ireland) 2012
http://www.legislation.gov.uk/nisr/2012/59/made

18 Republic of Ireland – S181 of the Planning and Development Act 2000
http://www.irishstatutebook.ie/eli/2000/act/30/section/181/enacted/en/index.html
and Statutory Instrument No. 403/2013 European Union (EIA and Habitats)
http://www.irishstatutebook.ie/eli/2013/si/403/made/en/print

19 Council Directive 92/43/EEC of 21 May 1992 on the conservation of natural habitats and of wild fauna and flora
https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=celex%3A31992L0043

20 The Conservation of Habitats and Species Regulations for England, Scotland, Wales and Northern Ireland are available from the Joint Nature Conservation Committee (JNCC) website
http://jncc.defra.gov.uk/page-1379
Republic of Ireland – S.I. No. 477/2011 - European Communities (Birds and Natural Habitats) Regulations 2011
http://www.irishstatutebook.ie/2011/en/si/0477.html and http://www.npws.ie/legislationandconventions/irishlaw/euregulations/

21 EU Water Framework Directive
http://ec.europa.eu/environment/water/water-framework/index_en.html

22 Guidance on implementing the Habitats Directive
http://ec.europa.eu/environment/nature/natura2000/management/guidance_en.htm

23 The Habitats Regulations Assessment Handbook (2014) http://www.dtapublications.co.uk/handbooks

24 Appropriate Assessment of Plans and Projects in Ireland: Guidance for Planning Authorities (2009 Rev2 2010)
https://www.npws.ie/protected-sites/guidance-appropriate-assessment-planning-authorities

25 Refer to: http://jncc.defra.gov.uk/page-1375

26 Refer to: http://www.wfdireland.ie/

27 Local Record Centres in Britain can be found through the Association of Local Record Centres (ALERC)
http://www.alerc.org.uk/

28 The Centre for Environmental Data and Recording (CEDaR) in Northern Ireland https://www.nmni.com/CEDaR/CEDaR-Centre-for-Environmental-Data-and-Recording.aspx

29 National Biodiversity Data Centre in Ireland
http://www.biodiversityireland.ie/

30 National Biodiversity Network Atlas Scotland
https://scotland.nbnatlas.org/

31 Marine Data Exchange
http://www.marinedataexchange.co.uk/

32 Guidelines for Accessing and Using Biodiversity Data in the UK (2016)
https://cieem.net/resource/guidelines_for_accessing_and_using_biodiversity_data/

33 A Coastal Concordat for England (2013)
https://www.gov.uk/government/publications/a-coastal-concordat-for-england

34 Adapted from Royal Town Planning Institute (RTPI) (2000) Planning for Biodiversity (out of print)

35 Guidelines for Ecological Report Writing: Second edition (2017)
http://www.cieem.net/guidelines-for-ecological-report-writing

36 England: National Planning Policy Framework (2018)
https://www.gov.uk/government/publications/national-planning-policy-framework--2

37 http://ec.europa.eu/environment/eia/eia-legalcontext.htm

38 Guidelines for Preliminary Ecological Appraisal: Second edition (2017)
https://www.cieem.net/guidance-on-preliminary-ecological-appraisal-gpea-

39 Oxford, M (2001) Developing Naturally. A handbook for incorporating the natural environment into planning and development. Association of Local Government Ecologists (out of print)

40 The Somerset Econet includes GIS distribution mapping of European protected species populations in Somerset
https://www.somerset.gov.uk/waste-planning-and-land/ecological-networks/

41 Reijnen MJSM, Veenbaas G and Foppen RPB (1995) Predicting the Effects of Motorway Traffic on Breeding Bird Populations. Dutch Ministry of Transport, Public Works and Water Management. Rijkswaterstraat, RWS and DLO Institute for Forestry and Nature Research. ISBN 903693707B

42 Refer to: https://www.gov.uk/construction-near-protected-areas-and-wildlife

43 Appropriate Assessment of Plans and Projects in Ireland: Guidance for Planning Authorities (2009 Rev2 2010)
https://www.npws.ie/protected-sites/guidance-appropriate-assessment-planning-authorities

44 Biodiversity: Code of practice for planning and development (2013) BS 42020:2013
https://shop.bsigroup.com/ProductDetail?pid=000000000030258704

45 CIEEM Professional Guidance Series: Access to Land (2011) (Available to CIEEM members)
https://cieem.net/resource/professional-guidance-series-pgs/

46 Guidelines for Accessing and Using Biodiversity Data in the UK (2016)
https://cieem.net/resource/guidelines_for_accessing_and_using_biodiversity_data/

47 The Convention on Biological Diversity (1993)
https://www.cbd.int/

48 Our life insurance, our natural capital: an EU biodiversity strategy to 2020 (2011)
http://ec.europa.eu/environment/nature/biodiversity/comm2006/2020.htm

49 Listed under S41 of the Natural Environment and Rural Communities Act 2006
http://publications.naturalengland.org.uk/publication/4958719460769792

50 Listed under S7 of the Environment (Wales) Act, 2016
http://www.biodiversitywales.org.uk/Environment-Wales-Act

51 Listed under S2(4) of The Nature Conservation (Scotland) Act 2004 http://www.legislation.gov.uk/asp/2004/6/contents

52 Refer to: https://www.daera-ni.gov.uk/publications/northern-ireland-list-priority-habitats

53 Refer to: https://www.daera-ni.gov.uk/articles/northern-ireland-priority-species

54 Refer to: https://www.npws.ie/sites/default/files/general/Listed_species_checklist_Dec12.pdf

55 Priority Marine Features (Scotland)
https://www.nature.scot/professional-advice/safeguarding-protected-areas-and-species/priority-marine-features-scotlands-seas

56 Ancient woodland inventories
England: https://data.gov.uk/dataset/9461f463-c363-4309-ae77-fdcd7e9df7d3/ancient-woodlands-england
Ireland: https://data.gov.ie/dataset/ancient-and-long-established-woodland-inventory-2010
Northern Ireland: https://ati.woodlandtrust.org.uk/back-on-the-map
Scotland: https://data.gov.uk/dataset/c2f57ed9-5601-4864-af5f-a6e73e977f54/ancient-woodland-inventory-scotland
Wales: https://naturalresources.wales/guidance-and-advice/environmental-topics/woodland-management/woodlands-and-the-environment/ancient-woodland-inventory/?lang=en

57 Refer to: http://jncc.defra.gov.uk/page-5718

58 Refer to: http://jncc.defra.gov.uk/page-5717

59 England – many Local Biodiversity Action Plans are now overseen by Local Nature Partnerships https://www.gov.uk/government/policies/protecting-biodiversity-and-ecosystems-at-home-and-abroad/supporting-pages/local-nature-partnerships
Wales – https://www.biodiversitywales.org.uk/Local-to-You
Scotland – https://www.nature.scot/local-biodiversity-action-plans-scotland
Northern Ireland – http://biodiversityni.com/
Ireland – Local Authority Biodiversity Action Plans may be found on the LA websites

60 Species of conservation concern UK
http://jncc.defra.gov.uk/page-5335

61 Irish Red Lists
https://www.npws.ie/publications/red-lists

62 Birds of Conservation Concern UK
http://www.rspb.org.uk/wildlife/birdguide/status_explained.aspx

63 Birds of Conservation Concern Ireland
https://www.birdwatchireland.ie/OurWork/SpeciesHabitatConservationinIreland/BirdsofConservationConcern/tabid/178/Default.aspx

64 Nationally rare and nationally scarce species UK
http://jncc.defra.gov.uk/page-3425

65 Nationally rare and nationally scarce species Ireland
https://www.npws.ie/sites/default/files/general/Listed_species_checklist_Dec12.pdf

66 Legally protected species UK
http://jncc.defra.gov.uk/page-3415

67 Legally protected species Ireland
https://www.npws.ie/legislation

68 OSPAR Commission list of threatened / declining species in the North-east Atlantic
https://www.ospar.org/work-areas/bdc/species-habitats/list-of-threatened-declining-species-habitats

69 See Article 10 of the Habitats Directive
http://eur-lex.europa.eu/LexUriServ/LexUriServ.do?uri=CELEX:31992L0043:EN:HTML

70 JNCC protected areas designations directory for the UK
http://jncc.defra.gov.uk/page-1527

71 NPWS protected sites in Ireland
http://www.npws.ie/protectedsites/

72 Scottish Natural Heritage Sitelink
http://gateway.snh.gov.uk/sitelink/

73 NIEA protected sites webpages for Northern Ireland
https://www.daera-ni.gov.uk/topics/biodiversity-land-and-landscapes/protected-areas

74 NRW protected areas in Wales
https://naturalresources.wales/guidance-and-advice/environmental-topics/wildlife-and-biodiversity/find-protected-areas-of-land-and-seas/?lang=en

75 England http://www.legislation.gov.uk/ukpga/2006/16/section/40
http://www.naturalengland.org.uk/ourwork/conservation/biodiversity/protectandmanage/habsandspeciesimportance.aspx

76 Wales
http://www.biodiversitywales.org.uk/Environment-Wales-Act

77 Scotland
https://www.nature.scot/scotlands-biodiversity/scottish-biodiversity-strategy/scottish-biodiversity-list

78 Priority Marine Features (Scotland)
https://www.nature.scot/professional-advice/safeguarding-protected-areas-and-species/priority-marine-features-scotlands-seas

79 Northern Ireland
https://www.daera-ni.gov.uk/publications/northern-ireland-list-priority-habitats m

80 Ireland: Wildlife Acts 1976 to 2012
http://www.npws.ie/legislation
National Biodiversity Action Plan 2017-2021
https://www.npws.ie/legislation/national-biodiversity-plan

81 Local biodiversity strategies – refer to individual websites e.g. Local Authorities, local BAP partnerships, Local Nature Partnerships

82 England: National Planning Policy Framework (2018)
https://www.gov.uk/government/publications/national-planning-policy-framework--2

83 England
https://webarchive.nationalarchives.gov.uk/20140605093420/http://www.naturalengland.org.uk/ourwork/conservation/biodiversity/protectandmanage/habsandspeciesimportance.aspx

84 Wales
http://www.biodiversitywales.org.uk/Environment-Wales-Act

85 Scotland
https://www.nature.scot/professional-advice/safeguarding-protected-areas-and-species/priority-marine-features-scotlands-seas

86 Priority Marine Features (Scotland)
http://www.snh.gov.uk/protecting-scotlands-nature/priority-marine-features/

87 Northern Ireland protected species
https://www.daera-ni.gov.uk/articles/northern-ireland-priority-species

88 Wildlife Acts 1976 to 2012
http://www.npws.ie/legislation

89 Red lists
http://www.npws.ie/publications/red-lists

90 BoCCI List (for Ireland and NI):
http://www.birdwatchireland.ie/LinkClick.aspx?fileticket=EjODk32LNcU%3D&tabid=178

91 Habitats Directive available at http://eurlex.europa.eu/LexUriServ/LexUriServ.do?uri=CELEX:31992L0043:EN:HTML

92 The Wildlife and Natural Environment Act (2011) amended the Wildlife (Northern Ireland) Order 1985
http://www.legislation.gov.uk/nia/2011/15/contents

93 Legislation for UK protected species
http://jncc.defra.gov.uk/page-3415

94 Marine (Scotland) Act 2010
http://www.legislation.gov.uk/asp/2010/5/pdfs/asp_20100005_en.pdf

95 Legislation for Irish protected species
https://www.npws.ie/legislation/

96 Designations associated with international listings
http://jncc.defra.gov.uk/page-3424

97 Guidance for Ireland and Northern Ireland at
http://invasivespeciesireland.com/

98 Refer to:
https://www.gov.uk/guidance/prevent-the-spread-of-harmful-invasive-and-non-native-plants

99 Refer to:
http://eur-lex.europa.eu/legal-content/EN/TXT/?qid=1417443504720&uri=CELEX:32014R1143

100 GB Invasive Non-Native Species Strategy
http://www.nonnativespecies.org/index.cfm?sectionid=55

101 UK National Ecosystem Assessment
http://uknea.unep-wcmc.org/Resources/tabid/82/Default.aspx

102 Natural Environment White Paper (2011)
https://www.gov.uk/government/publications/the-natural-choice-securing-the-value-of-nature

103 A Green Future: Our 25 Year Plan to Improve the Environment (2018)
https://www.gov.uk/government/publications/25-year-environment-plan

104 Environment (Wales) Act, 2016
http://www.legislation.gov.uk/anaw/2016/3/contents

105 Applying an ecosystems approach to land use: Information Note (2011)
https://www.gov.scot/publications/applying-ecosystems-approach-land-use-information-note/

106 2020 Challenge for Scotland's Biodiversity (2013) http://www.scotland.gov.uk/Publications/2013/06/5538

107 Sectoral Impacts on Biodiversity and Ecosystem Services (SIMBIOSYS) (2013)
http://www.epa.ie/pubs/reports/research/biodiversity/strive115simbiosys.html#.U_dvyGB0zmI

108 National Biodiversity Action Plan 2017-2021
https://www.npws.ie/legislation/national-biodiversity-plan

109 Oxford, M (2001) Developing Naturally. A handbook for incorporating the natural environment into planning and development. Association of Local Government Ecologists (out of print).

110 Common Implementation Strategy for the Water Framework Directive (2000/60/EC). Technical report on groundwater dependent terrestrial ecosystems (2011) https://circabc.europa.eu/sd/a/0500f8ef-d16b-4086-a152-d783d19bb0b8/Technical_report_No6_GWDTEs.pdf

111 Box, J, Dean, M & Oakley, M (2017) An alternative approach to the reporting of categories of significant residual effects in Environmental Impact Assessment. In Practice – Bulletin of the Chartered Institute of Ecology and Environmental Management 97: 47-50.

112 Refer to: http://www.noticenature.ie/files/Construction_v12.pdf and http://www.noticenature.ie/files/Notice%20Nature%20quarry%20brochure%20web_1.pdf

113 Biodiversity Offsetting https://www.gov.uk/biodiversity-offsetting

114 See for example the Business and Biodiversity Offsets Program (BBOP) bbop.forest-trends.org/

115 Biodiversity Net Gain: Good practice principles for development (2016) https://cieem.net/resource/biodiversity-net-gain-good-practice-principles-for-development/

116 Town and Country Planning Act 1990 http://www.legislation.gov.uk/ukpga/1990/8/contents

117 Biodiversity: Code of practice for planning and development (2013) BS 42020:2013 https://shop.bsigroup.com/ProductDetail?pid=000000000030258704

118 Adapted from clause 8.1 in Biodiversity: Code of practice for planning and development (2013) BS 42020:2013 http://shop.bsigroup.com/en/ProductDetail/?pid=000000000030258704

119 Guidelines for Ecological Report Writing (2015) http://www.cieem.net/guidelines-for-ecological-report-writing

120 Association of Local Environmental Record Centres http://www.alerc.org.uk/

121 UK Woodland Habitats including Ancient Woodland Inventory
England: https://data.gov.uk/dataset/9461f463-c363-4309-ae77-fdcd7e9df7d3/ancient-woodlands-england
Ireland: https://data.gov.ie/dataset/ancient-and-long-established-woodland-inventory-2010
Northern Ireland: https://ati.woodlandtrust.org.uk/back-on-the-map
Scotland: https://data.gov.uk/dataset/c2f57ed9-5601-4864-af5f-a6e73e977f54/ancient-woodland-inventory-scotland
Wales: https://naturalresources.wales/guidance-and-advice/environmental-topics/woodland-management/woodlands-and-the-environment/ancient-woodland-inventory/?lang=en

122 UK country biodiversity strategies – refer to: http://jncc.defra.gov.uk/page-5701
Irish Biodiversity strategy http://www.npws.ie/legislationandconventions/nationalbiodiversityplan/
UK Biodiversity Action Plan – refer to: http://jncc.defra.gov.uk/ukbap

123 Local biodiversity strategies – refer to individual websites e.g. Local Authorities, local BAP partnerships, Local Nature Partnerships

124 British Trust for Ornithology www.bto.org/volunteer-surveys/webs

125 BirdWatch Ireland https://www.birdwatchireland.ie/OurWork/ResearchSurveys/IrishWetlandBirdSurvey/tabid/111/Default.aspx

126 Centre for Environmental Data and Recording (CEDaR) www.nmni.com/cedar

127 CORINE LandCover 2006 raster data http://www.eea.europa.eu/data-and-maps/data/corine-land-cover-2006-raster-3

128 Ecosystems Knowledge Network http://ecosystemsknowledge.net/

129 EPA Geoportal Site http://gis.epa.ie/

130 European Nature Information System (EUNIS) http://eunis.eea.europa.eu/

131 Integrated Biodiversity Assessment Tool (IBAT) https://www.ibat-alliance.org/ibat-conservation/

132 International Council for Exploration of the Sea (ICES), including marine data portals http://www.ices.dk/marine-data/Pages/default.aspx

133 JNCC UK Protected Sites http://jncc.defra.gov.uk/page-4

134 Land Cover Map 2000 (LCM2000) (Centre for Ecology and Hydrology) https://www.ceh.ac.uk/services/land-cover-map-2000

135 LANDMAP Information system for Wales http://lle.gov.wales/Catalogue?lang=en&text=landmap

136 The Wildlife Trust's Living Landscape programme http://www.wildlifetrusts.org/living-landscape

137 Local Records Centres Wales https://www.lercwales.org.uk/

138 The Marine Life Information Network (MarLIN) http://www.marlin.ac.uk/

139 Marine Scotland Information - information portal on the Scottish marine environment http://marine.gov.scot/

140 Multi-Agency Geographical Information for the Countryside (MAGIC) http://www.natureonthemap.naturalengland.org.uk/

141 National Biodiversity Data Centre (Ireland) www.biodiversityireland.ie/

142 National Biodiversity Network www.nbn.org.uk

143 National Museums Northern Ireland: Habitas http://www.habitas.org.uk

144 National Parks and Wildlife Service http://www.npws.ie/ – includes protected sites information, habitats and species datasets (including national survey of native woodlands), licensing, links to legislation and map-viewer http://www.npws.ie/mapsanddata/

145 England – National Planning Policy Framework (NPPF) (2018) https://www.gov.uk/government/publications/national-planning-policy-framework--2
Wales – Planning Policy Wales (2016) http://wales.gov.uk/topics/planning/policy/ppw/?lang=en
Wales – Technical Advice Note 5: Nature Conservation and Planning (2009) http://wales.gov.uk/topics/planning/policy/tans/tan5/?lang=en
Scotland – Scottish Planning Policy (2014) http://www.scotland.gov.uk/Topics/Built-Environment/planning/Policy
Scotland - Planning Advice Note 60: Planning for Natural Heritage http://www.scotland.gov.uk/Publications/2000/08/pan60-root/pan60
Northern Ireland – Regional Development Strategy 2035 https://www.infrastructure-ni.gov.uk/publications/regional-development-strategy-2035
Northern Ireland - Planning Policy Statement 2: Natural Heritage (2013) https://www.planningni.gov.uk/index/policy/planning_statements/pps2.htm
Ireland – National Spatial Strategy 2002-2020 http://www.irishspatialstrategy.ie/

146 Natural Areas (England) www.naturalengland.org.uk/ourwork/conservation/biodiversity/englands/naturalareas.aspx

147 Natural Heritage Futures (Scotland) https://www.nature.scot/about-snh/our-work/natural-heritage-futures

148 Northern Ireland Environment Agency
https://www.daera-ni.gov.uk/northern-ireland-environment-agency

149 Landscape Character Areas
https://www.daera-ni.gov.uk/topics/land-and-landscapes/landscape-character-areas

150 Ordnance Survey Ireland - Online Mapping
https://www.osi.ie/

151 OSPAR Commission, including list of threatened and/or declining marine species
https://www.ospar.org/work-areas/bdc

152 RSPB Futurescapes
http://www.rspb.org.uk/whatwedo/futurescapes/

153 Scotland's Environment Web
https://www.environment.gov.scot/

154 Scottish Natural Heritage's Sitelink
http://gateway.snh.gov.uk/sitelink/index.jsp

155 Wales Marine Planning Portal, online maps showing human activity and natural resources
http://lle.gov.wales/apps/marineportal/#lat=52.5145&lon=-3.9111&z=8

156 Wave and Tidal Knowledge Network
http://www.waveandtidalknowledgenetwork.com/

157 Welsh Government and NRW's Geoportal Lle
http://lle.gov.wales/home

158 JNCC (2003) Handbook for Phase 1 Habitat Survey – a technique for environmental audit. JNCC, Peterborough

159 SNIFFER (2009) WFD95: A Functional Wetland Typology for Scotland; Project Report. SNIFFER, Edinburgh.

160 https://ihs.somerc.co.uk/index.php

161 Fossitt (2000) A Guide to Habitats in Ireland. The Heritage Council, Kilkenny.

162 http://archive.jncc.gov.uk/default.aspx?page=4259

163 http://www.biodiversityireland.ie/projects/national-vegetation-database/irish-vegetation-classification/

164 https://www.eea.europa.eu/data-and-maps/data/eunis-habitat-classification

165 https://www.nature.scot/snh-commissioned-report-766-manual-terrestrial-eunis-habitats-scotland

166 https://www.eea.europa.eu/publications/COR0-landcover

167 http://jncc.defra.gov.uk/page-5711 and http://jncc.defra.gov.uk/page-5718

168 http://ecountability.co.uk/ukhabworkinggroup-ukhab/





Raising the profile of professional ecological and environmental management and promoting the highest standards of practice for the benefit of nature and society.

CIEEM
Chartered Institute of Ecology and Environmental Management

43 Southgate Street
Winchester, Hampshire SO23 9EH

t: 01962 868626
e: enquiries@cieem.net
www.cieem.net