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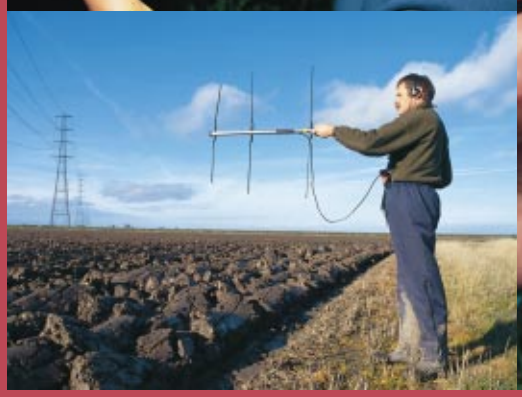
A practical toolkit for assessing cumulative effects of spatial plans and development projects on biodiversity in England

English Nature Research Reports



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Number 673

A practical toolkit for assessing cumulative effects of spatial plans and development projects on biodiversity in England

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Research Information Note

1 Introduction

1.1 Role of this toolkit

This draft toolkit presents practical guidance on how to carry out an assessment of the likely cumulative effects on biodiversity of spatial plans and development projects as an integral part of an overall environmental assessment influencing the preparation of these plans and projects.

It should be read in conjunction with:

- *English Nature Research Reports*, Number 626. Going, going, gone? The cumulative effect of land development in on biodiversity in England' (LUC for English Nature)
- *Strategic Environmental Assessment and Biodiversity: Guidance for Practitioners.* (Countryside Council for Wales, English Nature, Environment Agency, Royal Society for the Protection of Birds)
- *Sustainability Appraisal of Regional Spatial Strategies and Local Development Documents.* (The Office of the Deputy Prime Minister)
- *Environmental Impact Assessment – A guide to procedures.* (The Office of the Deputy Prime Minister)
- *Planning Policy Statement 9: Biodiversity and Geological Conservation* and *Government Circular: Biodiversity and Geological Conservation – Statutory obligations and their impact within the planning system*. (The Office of the Deputy Prime Minister)
- Habitats Regulations Guidance Notes 1-6 (English Nature).

English Nature has an important role to play with regards to the cumulative effects of development on England's biodiversity both through the organisation's role as a statutory consultee to the planning process and, through the need to consider the biodiversity of the wider countryside, and the effect increased development, no matter how small, may have on it.

This toolkit aims primarily to assist English Nature staff in responding to consultations from Regional Planning Bodies and Local Planning Authorities (hereafter referred to as Planning Authorities) who are either: conducting environmental assessments in the preparation of Regional Spatial Strategies and Local Development Documents, or considering environmental assessments prepared to accompany individual development proposals.

Planning Authorities and developers may also find this toolkit useful in ensuring that the likely cumulative effects of their spatial plans and development projects are considered from the very earliest stages of plan preparation and development design. It also gives Planning Authorities and developers insight into English Nature's expectations with respect to the identification, examination and reporting of likely cumulative effects of plans and projects.

This toolkit should help to raise awareness amongst decision-makers of the important contribution that cumulative effects make to changes in England's biodiversity and the urgent need to ensure that these effects are given serious consideration in the process of developing and adopting spatial plans and approving development projects.

Different methodologies and techniques for considering cumulative effects and the practical experience of English Nature staff have been drawn upon in this toolkit. The development of these methods and techniques is generally still in its infancy with a prevalence of emerging theory, but limited tried and tested practical measures available. Those included in this toolkit are intended as a guide to possible approaches. The list of references and sources of further information included at the back of this toolkit may provide others.

1.2 Key messages

The key messages of this toolkit are:

- Consideration of the likely cumulative effects of spatial plans and development projects should be seen as an integral part of the environmental assessment conducted in preparing spatial plans and in designing, constructing and operating developments and should be taken into account from the very earliest stage in these processes.
- An ecosystem-based approach, including consideration of ecosystem resilience and interactions between ecosystems and environmental capacity and environmental limits, should be adopted when considering the likely cumulative effects of development on biodiversity.
- The precautionary principle should be applied in circumstances where there is uncertainty about the possible cumulative effects of spatial plans and development projects to ensure that potentially significant cumulative effects are not overlooked in the environmental assessment process.
- The assessment of cumulative effects should include consideration of both positive and adverse effects.
- Consideration of cumulative effects requires a long-term view of the likely effects of spatial plans and development projects.
- In addition to the most protected sites, Planning Authorities responsible for the spatial planning of future development need to be aware of the wider countryside and its network of green infrastructure, local nature reserves, ancient woodland etc, which collectively sustain biodiversity.
- Global, national, regional and local concerns all need to be taken into account.

1.3 Why are cumulative effects important?

Biodiversity is a vital and integral part of the planet's life support system. It is essential to maintaining clean water, fertile soil and clean air, can be managed and used for economic benefit (eg to produce crops, medicines, building materials, fuel and tools), and has educational, aesthetic and spiritual values, which enrich our quality of life. Biodiversity in England has suffered a major decline in the twentieth century mainly due to the effect of human activities especially agriculture, forestry and development. These losses and pressures are augmented by direct and indirect developmental effects particularly incremental or negligible effects that are often underplayed in decision making. These cumulative effects are gradually reducing the viability of our biodiversity and as such have implications for our quality of life and that of future generations.

Furthermore, the protection of biodiversity is a major tenet of sustainable development, enshrined in the Rio Convention on Biological Diversity in 1992 and the UK Sustainable Development Strategy – 'Securing the Future – delivering a UK sustainable development strategy, March 2005'. The concept of sustainable development also lies at the heart of the English planning system which requires planning authorities to undertake their functions with a view to contributing to the achievement of sustainable development. Failure to take account of the cumulative effects of development will undermine the Government's sustainable development objectives and contribute to the reduction of biodiversity in England.

1.4 The legislative basis for assessing cumulative effects

At a European Community level, the requirement to consider the cumulative effects of spatial plans and development projects is established through three Directives:

- European Directive 2001/42/EC on the 'assessment of the effects of certain plans and programmes on the environment' (that is the 'Strategic Environmental Assessment' or SEA Directive).
- European Directive 85/337/EEC on 'the assessment of the effects of certain public and private projects on the environment' as amended by Directive 97/11/EC (that is the 'Environmental Impact Assessment' or EIA Directive).
- European Directive 92/43/EEC on 'on the conservation of natural habitats and of wild fauna and flora' (that is the Habitats Directive).

The SEA Directive requires Planning Authorities to conduct an environmental assessment during the preparation and before adoption of their spatial plans, including Regional Spatial Strategies and Local Development Documents. This Directive has been transposed into UK law through The Environmental Assessment of Plans and Programmes Regulations 2004, also know as the SEA Regulations. The SEA Directive and Regulations require that an environmental assessment of plans includes consideration of 'secondary, cumulative, [and] synergistic' effects (SEA Directive - Annex 1, SEA Regulations – Schedule 1).

In England, SEAs are being conducted by Planning Authorities as part of a broader Sustainability Appraisals of Regional Spatial Strategies and Local Development Documents in accordance with the Planning and Compulsory Purchase Act 2004 and Government guidance. Sustainability Appraisals, incorporating SEAs must include consideration of secondary, cumulative, and synergistic effects.

The EIA Directive requires that an EIA is carried out, before development consent is granted, for certain types of major projects which are likely to have significant environmental effects. The EIA Directive, as it applies to development projects subject to planning approval, has been transposed into UK law through a number of different sector specific EIA regulations. These include:

- The Town and Country Planning (Environmental Impact Assessment) (England and Wales) Regulations 1999;
- Highways (Assessment of Environmental Effects) Regulations 1999;
- Harbour Works (Environmental Impact Assessment) Regulations 1999;

- and other EIA Regulations dealing with pipelines, electricity works, nuclear reactors and other development related and non-development related projects.

The EIA Directive and the various UK EIA Regulations require that developers provide information on the '…indirect, secondary [and] cumulative…' effects of development (EIA Directive – Annex III, EIA Regulations - Schedule 4 (Part 1)).

The Habitats Directive requires that an Appropriate Assessment is conducted in respect of any plan or project, which is not directly connected with the management of a site for conservation purposes, which is likely to have a significant effect on a European Site 'either alone or in combination with other plans or projects' (Habitats Directive -Article 6.3, Habitats Regulations – Regulation 48). The Habitats Directive has been transposed into UK law through The Conservation (Natural Habitats &c.) Regulations 1994, more commonly know as the Habitats Regulations. The European Commission Guidance 'Managing Natura 2000 Sites - The provisions of Article 6 of the Habitats Directive 92/43/EEC' states that "the underlying intention of this combination provision is to take account of cumulative impacts, and that these will often occur over time".

The EIA Directive and Habitat Directive apply to development proposals which meet criteria set out in these Directives and their associated Regulations. However, most experts accept that nearly all development will have some effect on the surrounding local environment. This effect is often deemed as negligible or *de minimis* and consequently is given little, if any, consideration in decisions by planning authorities. Over time, however, there can be a slow build up of *de minimis* effects leading to potentially significant cumulative effects. Therefore it is important that cumulative effects are considered before consent is granted for developments requiring approval.

The General Development Procedure Order 1995 (the GDPO) requires that a planning authority consult English Nature and, under the provisions of section 28I of the Wildlife and Countryside Act 1981, to notify English Nature, before granting planning permission for development likely to damage a SSSI, even if the development is not located in the SSSI. These consultations provide an opportunity for English Nature to advise on the assessment of cumulative effects of these projects and to flag any likely significant cumulative effects that may arise from projects, not otherwise covered by the EIA Directive or the Habitats Directive.

This toolkit is intended to be applied to any development proposals which may result in cumulative effects whether or not they are covered by the EIA Directive or the Habitats Directive.

1.5 Structure of this toolkit

This toolkit is made up of five sections. Sections 1, 2 and 5 include information relevant to assessing cumulative effects for both spatial plans and development projects. These sections should be read in conjunction with: Section 3 for those who are considering cumulative effects assessment in the context of spatial planning, and Section 4 for those who are considering cumulative effects assessment in the context of development projects.

Section 1 sets the context to the toolkit.

Section 2 defines what is meant by cumulative effects, highlights some of the key cumulative effects identified in England and gives an overview of the process of assessing cumulative effects.

Section 3 provides a detailed toolkit for identifying, examining and reporting on the likely significant cumulative effects of Regional Spatial Strategies and Local Development Documents as part of a Sustainability Appraisal.

Section 4 provides a detailed toolkit for assessing significant cumulative effects as part of overall assessments of development projects.

Section 5 provides pointers to further development of the model process for cumulative effects assessment set out in this toolkit as well as giving an overview of the current state of play of cumulative effects assessment methodologies and techniques available.

This toolkit also includes a series of appendices on matters of detail, a quality assurance checklist, a glossary, a list of abbreviations, references and sources of further information, and a history of the revision of this document.

2 About cumulative effects

2.1 What are cumulative effects?

Cumulative effects are described as 'changes to the environment that are caused by an action in combination with other past, present and future human actions' (CEAA 1999). They can be positive or negative, as well as either direct (eg loss of land to development) or indirect (eg diffuse pollution). They can occur both spatially across geographic areas, and temporally over time, and can result from effects arising from a single development as well as effects arising from multiple developments. For the purpose of this toolkit cumulative effects should be taken to include direct, indirect, secondary, synergistic, additive, and antagonistic effects as well as effect interactions. For example cumulative effects may include:

Effects that result from incremental changes caused by other past, present or reasonably foreseeable actions together with the plan or project, sometimes referred to as additive effects. For example:

- Incremental noise from a number of separate developments.
- Combined effect of individual effects, eg noise, dust and visual intrusion, from one development on a particular ecological feature.
- Several plans or projects with insignificant effects individually but which together have a cumulative effect, eg development of a golf course may have an insignificant effect, but when considered with several nearby golf courses there could be a significant cumulative effect on local ecology and landscape.'

Effects on the environment, which are not a direct result of the plan or project, often produced away from or as a result of a complex pathway, sometimes referred to as indirect, second or third level effects, or secondary effects. For example:

- A development changes the water table and thus affects a nearby wetland causing an effect on the ecology of that wetland.
- Visual effect from the use of noise attenuation barriers as a mitigation measure.
- The development of a project, which in turn, attracts ancillary developments, eg a bypass scheme that attracts infill housing development.

The reactions between effects whether between the effects of just one plan or project or between the effects of other plans or projects in the areas which produce a total effect greater than the sum of the individual effects, sometimes referred to as effects interactions or synergistic effects. For example:

- A development producing two streams of waste that are individually acceptable but react in combination producing highly significant levels of pollution.
- Emissions to air from one project reacting with emissions from an existing development.

- Two major developments being constructed adjacent to one another and during overlapping time periods will have many interactive effects, from land use issues to construction and operational noise.

Cumulative effects often have a significant effect over time. Whereas an initial effect may not necessarily be assessed as significant, it is only when a number of such effects come together to have a significant effect that the full extent is realised. Cumulative effects often reduce ecosystem resilience over time. '*Resilience provides the capacity to absorb shocks whilst maintaining function…this adaptive capacity in ecological systems is related to genetic diversity, biological diversity and the heterogeneity of landscape mosaics'* (Swedish Environmental Advisory Council 2002). As an ecosystem's biodiversity is reduced so is its resilience. If these effects continue to mount up the ecosystem may pass a critical threshold resulting in the loss of the ecosystem and it's characteristic biodiversity. Considering thresholds is central to assessing cumulative effects and their effect on biodiversity.

2.2 What are some of the key cumulative effects to be considered?

The main development issues in England arise from the following:

- urban development and construction;
- roads and transport;
- water supply;
- waste management;
- energy consumption;
- mining and quarrying.

The main types of cumulative effect, both direct and indirect, caused by these drivers are:

- habitat loss- the direct loss of habitats under development;
- habitat fragmentation- the breaking down of habitat units into a smaller number of units;
- disturbance- through noise, light, recreation, pet predation, vibration etc;
- pollution- either chemical or biotic.

Development comes in many shapes and forms each of which is likely to have some sort of cumulative effect on England's biodiversity. The most obvious types of development are housing and roads, however there are a number of other urban, transport and infrastructure schemes that produce and contribute to a variety of cumulative effects. The Government has recently paved the way for an increase in development around the country through a series of plans including The Sustainable Communities Plan for Housing, The Transport Ten Year Plan, and The Airports White Paper. These plans could result in more than 750,000 new dwellings, 100 new bypasses, 130 other road improvement schemes, and a number of new terminal and runway projects at England's airports. This will lead to increased consumption of water, minerals and energy and will produce increased amounts of waste. Taken together this potentially poses, a significant threat to England's biodiversity, through habitat loss,

fragmentation, disturbance and pollution, as well as other direct, indirect and cumulative effects.

The statutory requirement for appraisal of development plans throughout Europe marks recognition that significant effects can arise from development and land use change proposed in development plans. As such they place important obligations on planning bodies to take account of cumulative effects in making decisions on development.

2.3 Making a case

'Going, going, gone? The cumulative impact of land development on biodiversity in England' (English Nature 2005) highlighted the significant cumulative effects that land development is having on biodiversity in England. However, it was not possible, based on the evidence available, to determine if the cumulative weight of planned or desired development in England is sustainable, or if it is likely to prevent recovery of biodiversity and ecosystem functioning and resilience to sustainable levels. To convince decision-makers that the cumulative effects of a spatial plan or development project on biodiversity are significant it will be essential to prepare a robust case including:

- A sound evidence base linked to baseline information and, where possible including reference to other studies emphasising the significance of the effects likely to arise.
- Clear and simple techniques for illustrating the cause-effect relationship between the development proposal and the significant cumulative effects predicted.

There is a range of research which has already been conducted on the effects of land development on biodiversity and ecosystems. A number of these are listed in Appendix 1 of this toolkit to allow those undertaking assessments of cumulative effects to take advantage of existing sources of information (eg evidence relating to recreational impacts on Schedule 1 Birds). Application of this toolkit should lead to on-going consideration of this research, scrutiny of its findings, and the collation of new and updated evidence on a range of cumulative effects of development. In particular there is a need for research into thresholds, indirect effects and how different effects inter-relate. There is also a need for better research on individual species, and groups of species.

Application of this toolkit will also test the usefulness of the assessment methods and techniques advocated, such as the use of network systems and conceptual models. This may lead to the development of new and more effective measures for identifying, assessing and reporting on cumulative effects. On this basis, it may be appropriate to review this toolkit in the future with a view to providing more up-to-date methods and techniques for cumulative effects assessment based on experience and good practice.

Monitoring of the cumulative effects of spatial plans and development projects will also make a potentially significant contribution to the state of understanding and knowledge of how the cumulative weight of land development may affect biodiversity. In particular, it will provide a useful test of the accuracy of predictions made in the assessment process and should reduce the level of uncertainty in future assessments. Monitoring may also provide the evidence needed to establish the capacity of ecosystems to accommodate development and the thresholds beyond which irreversible damage to biodiversity will result, ultimately allowing environmental limits to be more clearly defined.

2.4 How are cumulative effects assessed?

Figure 2.1 sets out the key stages and tasks to be conducted to identify, examine and record the likely significant cumulative effects of spatial plans and development projects. The purpose of each task and key questions to be answered in conducting the assessment are also included to focus the assessment process. **Figure 2.2** illustrates how these individual tasks inter-relate. As demonstrated in **Figure 2.2**, cumulative effects assessment is an iterative process and the individual tasks may need to be repeated as options are appraised and more sustainable options emerge.

Cumulative effects assessment stages and tasks	Purpose of cumulative effects assessment tasks
Stage 1 Preliminary review	
1.1: Describing the plan or project	To define the proposed plan or project.
1.2: Identifying the types of cumulative effects that may arise	To identify possible cumulative effects that may arise as a result of the type of plan or project proposed.
1.3: Deciding if an assessment of cumulative effects should be conducted	To decide if an assessment of cumulative effects should be conducted based on the possible cumulative effects that may arise as a result of the type of proposed plan or project.
Stage 2: Scoping the assessment	
2.1: Identifying the ecological features likely to be affected	To describe the geographical extent of the area likely to be affected by the plan or project and the important ecological features within this area which are likely to be affected.
2.2: Describing the current state of the ecological features and key environmental issues	To characterise the current state of the ecological features likely to be affected by the plan or project and to provide an evidence base for identification of environmental issues.
2.3: Describing the evolution of the ecological features without implementation of the plan or project	To describe the evolution of the ecological features likely to be affected by the plan or programme, without implementation of the plan or project.
2.4: Developing the cumulative effects assessment process	To describe how the cumulative effects of the plan or project will be assessed.
Stage 3: Assessing the cumulative effects	
3.1: Predicting the likely cumulative effects of the plan or project, including alternatives	To predict the likely cumulative effects of the plan or project, and reasonable alternatives, on the ecological features.
3.2: Assessing the cumulative effects of the plan or project, including alternatives	To assess the significance of the predicted cumulative effects of the plan or project, and any reasonable alternatives, and to assist in the refinement of the plan or project.

Cumulative effects assessment stages and tasks	Purpose of cumulative effects assessment tasks
3.3: Mitigating adverse cumulative effects and maximising beneficial cumulative effects	To ensure all potential mitigation measures, including measures to maximise beneficial effects and minimise adverse effects are considered and as a result residual effects identified.
3.4: Developing proposals for monitoring cumulative effects	To detail the means by which the ecological performance of the plan or project can be monitored.

Figure 2.1 Cumulative effects assessment: stages and tasks

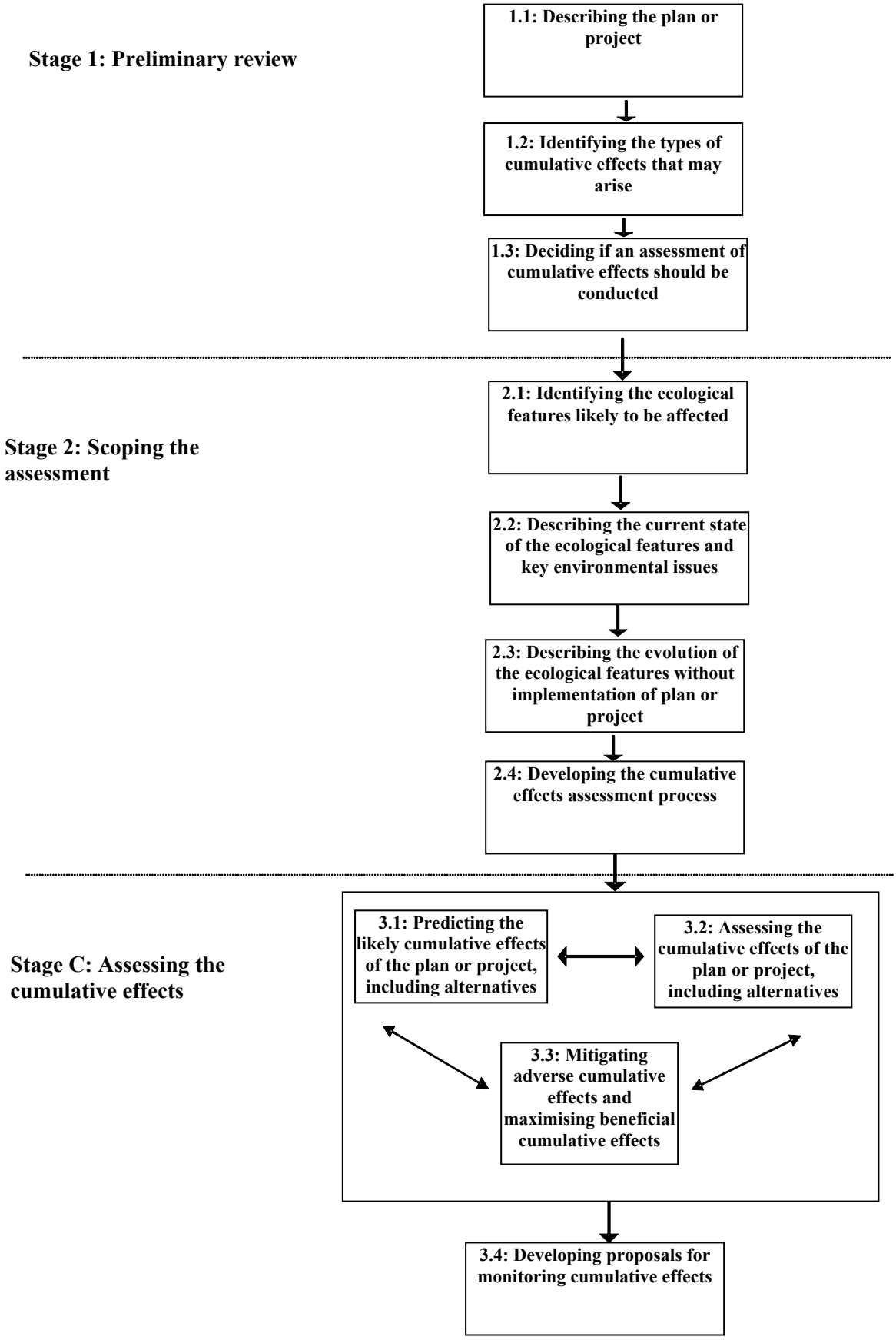

Figure 2.2 Relationship between cumulative effects assessment stages and tasks

3 Assessing the cumulative effects of spatial plans

This section provides a detailed toolkit for identifying, examining and reporting on the significant cumulative effects on biodiversity of Regional Spatial Strategies (RSS) and Local Development Documents (LDD) (including Development Plan Documents (DPDs) and Supplementary Planning Documents (SPDs)) as part of a Sustainability Appraisal.

RSSs, incorporating Regional Transport Strategies (RTSs), will articulate a spatial vision for their region as a whole and provide a concise spatial strategy for achieving that vision (defining its main aims and objectives) illustrated by a key diagram, and the policies highlighted.

LDDs prepared by Local Planning Authorities (LPAs) will include:

- Core Strategy DPDs – These will set out the key elements of the planning framework for the Local Planning Authority area. They should be comprised of a spatial vision and strategic objectives for the area; a spatial strategy; core policies; and a monitoring and implementation framework with clear objectives for achieving delivery.
- Site Specific Allocations DPDs – These may identify land for specific uses (including mixed uses) and can include policies relating to the delivery of site specific allocations, such as critical access requirements or broad design principles which may be sought.
- Area Action Plan DPDs – These should be used to provide the planning framework for areas where significant change or conservation is needed within a LPA area. In areas of change, these should identify the distribution of uses and their inter-relationships, including specific site allocations, and set the timetable for the implementation of proposals. In areas of conservation, these should set out the policies and proposals for action to preserve or enhance the area, including defining areas where specific conservation measures are proposed and areas which will be subject to specific controls over development.
- Other DPDs (eg Development Control Policies DPDs) – These may include such information as the Local Planning Authority deems necessary to control development within its area consistent with its Core Strategy and other DPDs.
- Supplementary Planning Documents – These will be used to expand policy or provide further detail to policies in DPDs, and can take a wide variety of different forms.

English Nature, and the other Consultation Bodies designated under the SEA Regulations, will be consulted at three key stages in the preparation of a RSS or LDD:

- Before a planning authority determines if a spatial plan which deals with the use of "small areas at local level", or which makes "minor modifications" should be subject to environmental assessment because it is likely to have significant environmental effects.
- When a planning authority is deciding on the scope and level of detail of the Sustainability Appraisal (SA) to be conducted.

- When the planning authority consults the public and other stakeholders on the draft spatial plan and SA Report.

Figure 3.1 sets out the key stages and tasks to be conducted in undertaking a Sustainability Appraisal of RSSs and LDDs and how the process of assessing the cumulative effects of spatial plans can be conducted within the context of this broader appraisal process.

Stages when English Nature may be consulted on a sustainability appraisal	**Cumulative effects assessment stages and tasks**	**Questions to be considered by English Nature**
Screening	**Stage 1: Preliminary review**	
Deciding if a Strategic Environmental Assessment is required.	1.1: Describing the plan or project	Has a SA Scoping Report been provided? Has the likely content of the RSS or LDD, including its geographical extent, been described in sufficient detailed to enable general conclusions to be drawn about its potential cumulative effects?
	1.2: Identifying the types of cumulative effects that may arise	What are the types of cumulative effects that could arise from the RSS or LDD?
	1.3: Deciding if an assessment of cumulative effects should be conducted	Could these cumulative effects be significant?
Stage A: Setting the context and objectives, establishing the baseline and deciding on the scope	**Stage 2: Scoping the assessment**	
Task A1 – Identifying other relevant plans, programmes and sustainability objectives Tasks A2 – Collecting Baseline Information Task A3 – Identifying sustainability issues Task A4 – Developing the Sustainability Appraisal Framework Task A5 – Consulting on the scope of the SA	2.1: Identifying the ecological features likely to be affected	Have all the potential types of cumulative effects that may arise been identified? Has the potential spatial and temporal scale of these cumulative effects been described?
	2.2: Describing the current state of the ecological features and identifying key environmental issues	Have all the ecological features that could be affected by these cumulative effects been identified and their current condition described?
	2.3: Describing the evolution of the ecological features without implementation of the plan or project	Has the likely evolution of the ecological features that could be affected, without implementation of the spatial plan, been described, taking into account the potential effects of other relevant policies, plans, programmes and development projects?
	2.4: Developing the cumulative effects assessment process	Has the process for assessing the likely cumulative effects of the spatial plan been described along with how these will be taken into account in the preparation of the spatial plan?

Stages when English Nature may be consulted on a sustainability appraisal	Cumulative effects assessment stages and tasks	Questions to be considered by English Nature
Stage B: Developing and appraising options	**Stage 3: Assessing the cumulative effects**	
Task B1 – Testing the plan objectives against the SA Framework Task B2 – Identifying and appraising options Task B3 – Predicting the effects of the plan, including alternatives Task B4 – Assessing the effects of the plan, including alternatives Task B5 – Mitigating adverse effects and maximising beneficial effects Task B6: Developing proposals for monitoring	3.1: Predicting the likely cumulative effects of the plan or project, including alternatives	Have all the likely cumulative effects been identified? Have all the ecological features that are likely to be affected by these cumulative effects been identified?
	3.2: Assessing the cumulative effects of the plan or project, including alternatives	Are the judgements made in relation to the likely significance of the cumulative effects sound and based on the most up-to-date research and baseline information? Have all the other relevant policies, plans, programmes and development projects that may affect the same ecological features been identified and their likely effects taken into account?
	3.3: Mitigating adverse cumulative effects and maximising beneficial cumulative effects	Are there other reasonable alternatives or mitigation measures that should have been considered which could reduce any adverse cumulative effects and increase the positive cumulative effects?
	3.4: Developing proposals for monitoring cumulative effects	Have proposals for monitoring the cumulative effects been set out?

Figure 3.1 Sustainability appraisal and cumulative effects assessment: stages and tasks

The level of detail in sustainability appraisal

An assessment of cumulative effects need not be done in any more detail, or using any more resources, than is useful for its purpose. The SEA Directive requires consideration of the significant environmental effects of the spatial plan, and of reasonable alternatives that take into account the objectives and the geographical scope of the spatial plan. It is desirable to provide sufficient commentary to justify the conclusions arrived at, with reference to the baseline information wherever possible.

Article 5 of the SEA Directive lists factors to be considered in deciding what information to include in an Environmental Report:

- Information that may reasonably be required, taking into account current knowledge and methods of assessment.
- The contents and level of detail of the spatial plan.
- The objectives and geographical scope of the spatial plan.
- The stage reached in the decision-making process.
- The extent to which it would be more appropriate to assess certain matters elsewhere in the decision-making process.

3.1 Stage 1 – preliminary review

Stage 1 checklist

- Has the likely content of the RSS or LDD, including its geographical extent, been described in sufficient detailed to enable general conclusions to be drawn about its potential cumulative effects?
- What are the types of cumulative effects that could arise from the RSS or LDD?
- Could these cumulative effects be significant?
- Has a SA Scoping Report been provided?

This stage is particularly important when a Planning Authority is consulting English Nature, and the other Consultation Bodies designated under the SEA Regulations, on whether or not a spatial plan is likely to require an SEA. Such consultation is only required in those exceptional cases when a Planning Authority must decide whether or not a spatial plan which deals with the use of "small areas at local level", or which makes "minor modifications" to an existing plan is likely to have significant environmental effects (whether positive or adverse), and as such does or does not require SEA. In the majority of instances, RSSs and LDDs will require SEA and consultation with English Nature on whether or not an SEA should be conducted will not be necessary.

Consultation at this early stage is intended to allow English Nature to provide advice to LPAs on whether or not a spatial plan is likely to have significant effects. This consultation may be conducted as part of the consultation carried out on the SA Scoping Report early in the preparation of a LDD. LPAs may seek to consult on this as part of consultation on a number of LDDs' at the same time. Where this happens, each LDD and the related opinion of the Local Planning Authority on whether a SEA is necessary will be consulted upon. English Nature will need to provide views on each LDD it is consulted upon. Following this consultation, the LPA will make a formal determination on whether or not significant environmental effects are likely and whether a SEA will be conducted.

Of all the spatial plans, English Nature is most likely to be consulted on the need for SEA of SPDs at this stage, although consultation may also be conducted on the need for SEA of DPDs (eg Area Action Plan DPDs). It is most unlikely that a RSS would ever fall into the category of being a small area at a local level or a minor modification.

In addition to informing English Nature's response to consultations on whether or not SEA is required for certain spatial plans, this stage will also help define the scope and level of detail of the environmental assessment to be conducted, where SEA is required. This will be discussed in more detail in Stage 2.

Task 1.1: Describing the spatial plan

Understanding the nature and scale of the spatial plan to be prepared is a prerequisite to deciding the types of cumulative effects that may arise and which of these, if any, are likely to be significant.

When consulting English Nature on whether or not a spatial plan is likely to have significant environmental effects, planning authorities should provide sufficient information on the spatial plan being prepared, including its geographic extent and the nature and level of detail of the policies to be included.

At this early stage there may be limited information that the Planning Authority can provide about the likely content of the spatial plan. It may be necessary for English Nature staff to make some assumptions, based on Government guidance (see Planning Policy Statement 11 - Regional Spatial Strategies and Planning Policy Statement 12 – Local Development Frameworks for more information on what RSSs and LDDs should include) as well as Government Planning Policy Statements and targets for housing and employment growth which may be relevant to the RSS or LDD.

Wherever possible, English Nature should obtain a copy of the SA Scoping Report for the RSS or LDD from the planning authority to help inform this stage. The SA Scoping Report will provide an outline of the proposed RSS or LDD and its objectives.

Task 1.2: Identifying the types of cumulative effects that may arise

The purpose of this task is to identify the possible cumulative effects that may arise as a result of the type of RSS or LDD proposed using information obtained in Task 1.1. English Nature officers will already be aware of many environmental issues which may result from the implementation of certain spatial policies. These will be based on:

- knowledge of key environmental problems and issues within the LDD area;
- earlier experience with issues identified in other spatial plans and development projects;
- analysis of tensions or inconsistencies with other policies, plans, programmes, and development projects.

The SA Scoping Report for the RSS or LDD should also provide a useful source of information on the key environmental problems and issues within the RSS or LDD area and other relevant plans and programmes which may help in the identification of possible cumulative effects.

Appendix 1 includes a checklist of cumulative effects that may arise as a result of certain types of development. This may be useful in identifying the types of cumulative effects which may result from implementation of an RSS or LDDs. In particular, English Nature staff should consider to what degree the RSS or LDD may contribute to habitat loss, habitat fragmentation, disturbance and/or pollution.

Task 2.1 below also gives some methods for identifying the types of cumulative effects that may arise which may also be useful at this stage.

Task 1.3: Deciding if an assessment of cumulative effects is required

The purpose of this task is to help English Nature staff to identify the potentially significant cumulative effects of the RSS or LDD that should be considered in deciding on the scope and level of detail of the SA to be conducted. In addition, in circumstances where English Nature is being consulted on whether or not a SEA should be conducted for an LDD, this task will help to establish if the LDD is likely to result in any significant cumulative effects which should be examined further; keeping in mind that, in some instances, even relatively small cumulative effects may be significant.

In deciding if an RSS or LDD is likely to result in significant cumulative effects the following questions should support a precautionary approach and avoid overlooking potentially significant cumulative effects. The following can be used as a guide:

- How resilient are the ecosystems that are likely to be affected (eg are the affected ecosystems sufficiently complex and robust to resist change)?
- Are particularly important elements of the receiving environment likely to be affected (eg Natura 2000 sites, Sites of Special Scientific Interest, National Nature Reserves etc)?
- How far is the current environmental situation from any established thresholds or targets (eg dormouse populations can only be sustained in woods of 20 hectares or more, most woodland bird species require at least 10 hectares before they will breed)?

English Nature's responses to LPA consultations on whether LDDs are likely to have significant environmental effects should include information on:

- The assumptions made about the nature of the LDD, including its geographic extent and the scope and level of detail of the policy to be included.
- The likely cumulative effects which are expected to occur as a result of the LDD.
- Whether English Nature considers that the cumulative effects identified are likely to be significant and if so why.

English Nature's views on the likely significant cumulative effects of a LDD should be included in its broader response on the likely significant effects of the LDD.

3.2 Stage 2 – scoping the assessment

Stage 2 checklist

- Have all the potential types of cumulative effects that may arise been identified?
- Has the potential spatial and temporal scale of these cumulative effects been described?
- Have all the ecological features that could be affected by these cumulative effects been identified and their current condition described?
- Has the likely evolution of the ecological features that could be affected, without implementation of the spatial plan, been described, taking into account the potential effects of other relevant policies, plans, programmes and development projects?
- Has the process for assessing the likely cumulative effects of the spatial plan been described along with how these will be taken into account in the preparation of the spatial plan?

Planning authorities will consult English Nature on the scope and level of detail of the SAs to be conducted for RSSs and LDDs through consultation on a SA Scoping Report. In preparing the Scoping Report Planning Authorities will compile the background information needed and set out the SA process to be conducted. They will consider what information they already have and what more they will need. They may hold some useful information themselves as well as requesting information from English Nature.

The purpose of this consultation is to enlist the assistance of English Nature in ensuring that there is adequate information available to enable a thorough appraisal of the likely effects of the RSS or LDD, and to ensure that the SA process is robust and meets the requirements of the SEA Directive.

In responding to consultations on the scope and level of detail of SAs, English Nature should provide planning authorities with advice on what aspects of the Scoping Report they consider useful as well as where further information may be required. For example further information may be needed on the current state of the ecological features likely to be affected by the RSS or LDD, how the ecological features would evolve without the implementation of the RSS or LDD, or on the SA process to be conducted. In making requests for further information, English Nature should take account of the capacity of Planning Authorities to collate relevant information and the need to provide clear advice on any detailed matters where English Nature is best placed to provide guidance on what is needed.

Task 2.1: Identifying the ecological features likely to be affected

The main purpose of this task is to identify the ecological features that may be affected by the cumulative effects arising from the RSS or LDD. This involves setting the spatial and temporal boundaries for the assessment of cumulative effects.

A RSS or LDD is likely to have a range of cumulative effects, and these effects will in turn affect a number of ecological features. Some of the potential effects of the RSS or LDD and the ecological features likely to be affected, will have already been identified by English

Nature staff as part of the first stage of this process. However, a more comprehensive consideration of these may be necessary to inform this scoping stage.

The links between the RSS or LDD proposed and its potential effects on the various ecological features can be illustrated using methods that show their cause-effect relationship. **Figures 3.2, 3.3 and 3.4** show how network analysis, tables, and diagrams can be used to establish this cause-effect relationship. **Appendix 1** gives a checklist of cumulative effects that may arise as a result of certain types of development. This may be useful in identifying the types of cumulative effects which may result from implementation of a RSS or LDD. It is important to keep in mind that each of the potential cumulative effects could affect one or more ecological features. These various inter-relationships should be reflected in the process of identifying cause-effect relationships.

Development (driver)	Cause of change (pressure)	Ecological feature (state)	Cumulative effect (impact)
Use of land for flood management, transport infrastructure and industrial development.	Clearing of land and infrastructure construction	Wildlife	Habitat fragmentation
Industrial development and increases in traffic volumes.	Greenhouse gas emissions	Sensitive plant and animal communities	Climate change and associated long-term impacts
Industrial development and increases in traffic volumes.	Noise generation	Breeding birds	Loss of tranquillity, disturbance, reduced breeding success

Figure 3.2 Example of a table for recording development, causes of change, ecological features and cumulative effects

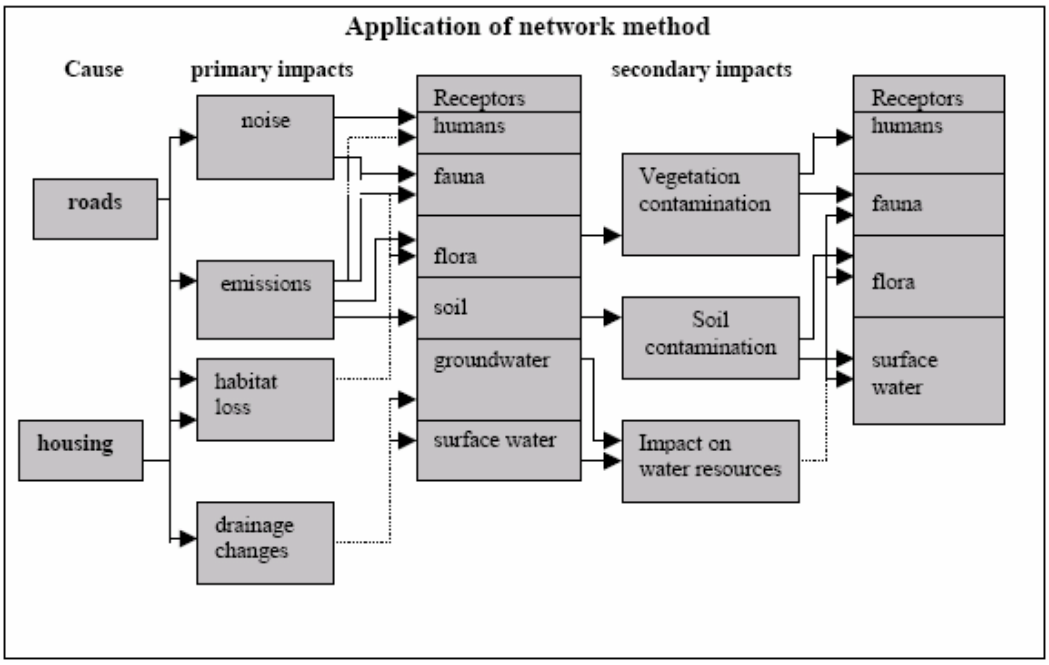

Figure 3.3 Application of network analysis and impact chains (Source Cooper 2003)

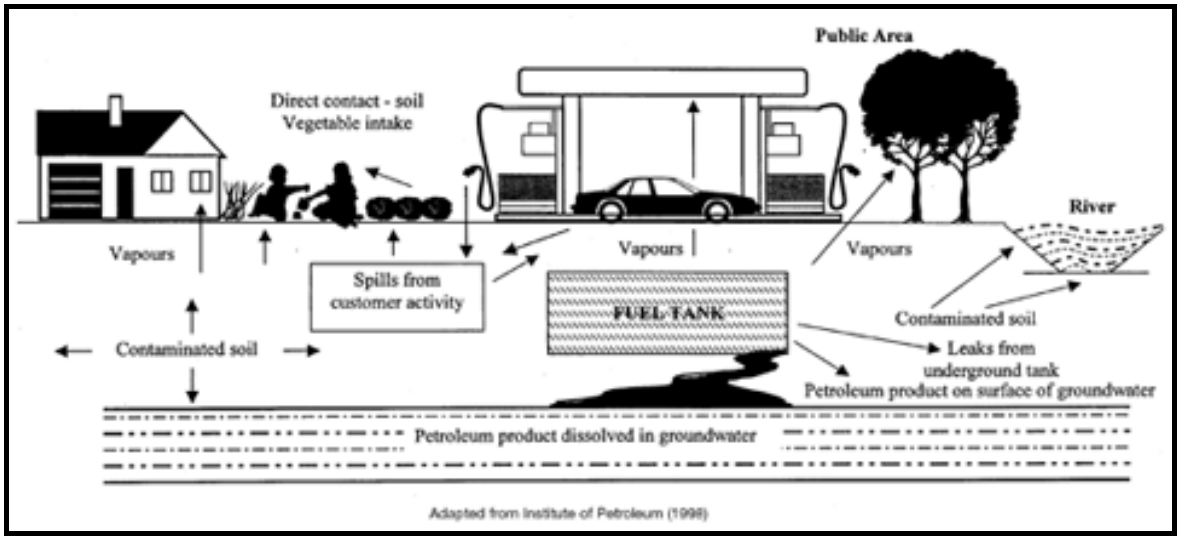

Figure 3.4 Example of a simplified, illustrative conceptual model for the cause and effect relationships of cumulative effects (DEFRA 2000)

Once the potential effects of the RSS or LDD have been identified the temporal and spatial extent of these effects should be considered to establish an appropriate geographic scope for the assessment and to identify the ecological features within this area which are likely to be affected. The geographical extent of the effects will vary depending on the type of effect, the pathways connecting the source of the effects to the ecological feature, and the sensitivity of the ecological feature. For example, the cumulative effects caused by recreational visitors to nature reserves will depend on the sensitivity of the nature reserve to visitors and on the accessibility of the nature reserve. There may be a need for different geographic boundaries for different effects. These should be based on ecological catchments (eg river basins, natural areas etc) and on the spatial extent of the potential significant cumulative effect. **Figure 3.5** describes an example approach to establishing the geographic extent of an assessment and the ecological features to be considered.

The *Canadian Environmental Assessment Agency Guidance* (1999) suggests a useful approach for establishing the geographic extent of an assessment and the ecological features to be considered:

- establish a local study area in which the obvious, easily understood and often mitigatable effects will occur;
- establish a (sub-) regional study area that includes the areas where there could be possible interactions with other actions, taking account of the interests of other stakeholders and their policies, plans, programmes and development projects;
- consider the use of several boundaries, one for each ecological feature, as this is preferable to one boundary;
- ensure boundaries are ecologically defensible wherever possible;
- expand boundaries to address the cause-effect relationships between actions and the ecological features;
- ensure boundaries take into account the abundance and distribution of the ecological features at a local, regional and larger scale if necessary (ie for rarer species);

- determine if geographic constraints may limit cumulative effects within a relatively confined area;
- characterise the nature of pathways that describe the cause and effect relationships to establish a line of enquiry;
- set boundaries at a point where cumulative effects become insignificant;
- be prepared to adjust the boundaries during the assessment process if new information suggests this is warranted, and defend any such changes.

Figure 3.5 Example approach to establishing the geographic extent of an environmental assessment and the ecological features to be considered

It may be necessary to set appropriate temporal and spatial boundaries for some ecological features to reflect their distribution and patterns of movement. For example, the boundaries for migratory bird populations may extend beyond the administrative area because deterioration or loss of breeding habitat could influence population levels and resource use over extensive areas (eg regional, national, international areas).

Geographic Information Systems (GIS) provide a useful way of mapping both geographic and temporal boundaries and Planning Authorities should be encouraged to use them. Once mapped the boundaries can provide an area of search or 'catchment'. Other policies, plans, programmes and development projects or ecological features that fall within this catchment can then be considered in the assessment of cumulative effects.

Identifying an area's ecological features is vital for the assessment of cumulative effects which is based upon the assessment of multiple effects on the ecological features. These ecological features will include the more obvious internationally and nationally designated sites but should also include locally designated sites, green corridors and links as well as other important ecological features, such as ancient woodland and old hedgerows. **Figure 3.6** sets out an approach to valuing ecological features which can be used as a guide to focus the assessment of cumulative effects on the important ecological features within the area likely to be affected by the RSS or LDD.

Level of value	Examples
International	• An internationally designated site or candidate site (SPA, pSPA, SAC, cSAC, pSAC, Ramsar site, Biogenetic Reserve) or an area which the country agency has determind meets the published selection criteria for such designation, irrespective of whether or not it has yet been notified. • A viable area of a habitat type listed in Annex 1 if the Habitats Directive, or smaller areas of such habitat which are essential to maintain a viability of a larger whole. • Any regular occurring population of an internationally important species, which is threatened or rare in the UK. ie it is a UK Red Data Book species or listed as occurring in 15 or fewer 10km squares in the UK (categories 1 and 2 in the UK BAP) or of uncertain conservation status or of global conservation concern in the UK BAP. • A regular occurring, nationally significant population/number of an internationally important species.

Level of value	Examples
National	• A nationally designated site (SSSI, ASSI, NNR, Marine Nature Reserve) or a discrete area, which the country conservation agency has determined meets the published selection criteria for national designation (eg SSSI selection guidelines) irrespective of whether or not it has yet been notified. • A viable area of a priority habitat identified in the UK BAP, or of smaller areas such as habitat which are essential to maintain the viability of a larger whole. • Any regularly occurring population of a nationally important species which is threatened or rare in the region or county (see local BAP). • A regularly occurring, regionally or county significant population/number of any nationally important species. • A feature identified as of critical importance in the UK BAP.
Regional	• Viable areas of key habitat identified in the Regional BAP or smaller areas if such habitat which are essential to maintain the viability of a larger whole; • Viable areas of key habitat identified as being of Regional value in the appropriate Natural Area profile; • Any regularly occurring, locally significant population of a species listed as being nationally scarce which occurs in 16-100 10km squares in the UK or in a Regional BAP or relevant Natural Area on account of its regional rarity or localisation; • A regularly occurring, locally significant number of a regionally important species; • Sites which exceed the County-level designations but fall short of SSSI selection guidelines, where these occur.
County / Metropolitan	• Semi-natural ancient woodland greater than 0.25 ha; • County/Metropolitan sites and other sites which the designating authority has determined meet the published ecological selection criteria for designation, including Local Nature Reserves selected on County/Metropolitan ecological criteria (County/Metropolitan sites will often have been identified in local plans); • A viable area of habitat identified on County BAP; • Any regularly occurring, locally significant population of a species which is listed in a County/Metropolitan "red data book" or BAP on account of its regional rarity or localisation; • A regularly occurring, locally significant number of a County/Metropolitan important species.
District / Borough	• Semi-natural ancient woodland smaller then 0.25 ha; • Areas of habitat identified in a sub-County (District/Borough) BAP or in the relevant Natural Area profile; • District sites that the designating authority has determined meet the published ecological selection criteria for designation including Local Nature Reserves selected on District/Borough ecological criteria (District sites, where they exist, will often have been identified in local plans) • Sites/features that are scarce within the District/Borough or which appreciably enrich the District/Borough habitat resource; • A diverse and/or ecologically valuable hedgerow network; • A population of a species that is listed in a District/Borough BAP because of its rarity in the locality or in the relevant Natural Area profile because of its regional rarity or localisation; • A regularly occurring, locally significant number of a District/Borough important species during a critical phase of its life cycle.
Parish / Borough	• Areas of habitat considered to appreciably enrich the habitat resource within the context of the Parish or neighbourhood, eg species-rich hedgerows. • Local Nature Reserves selected on Parish ecological criteria.

Figure 3.6 An approach to valuing ecological features (IEEM 2002)

The SA Scoping Report, prepared by the Planning Authority, will describe the nature of the RSS or LDD being prepared and its geographical scope. It should also describe the types of cumulative effects that could arise, the extent of the area likely to be affected and the important ecological features within this area that could be affected.

Task 2.2: Describing the current state of the ecological features and identifying key environmental issues

Some of the ecological features likely to be affected by a RSS or LDD will already be under stress from various types of existing development and activities while others will be in good condition. For example, Sites of Special Scientific Interest (SSSIs) may or may not be achieving favourable condition. Before the likely cumulative effects of the RSS or LDD are considered, sufficient information about the current state of the environment, including trends, should be collected to allow the RSSs or LDDs effects to be adequately predicted.

The SA Scoping Report should provide information on the current condition of the ecological features which could be affected by the cumulative effects of the RSS or LDD. For each ecological feature, enough information should be provided to answer the following questions:

- How good or bad is the current situation? How resilient is the ecological feature?
- How far is the current situation from any established thresholds or targets?
- What effects are other policies, plans, programmes or development projects already having on the ecological feature? Is it getting worse or better and if so why?
- Are the problems reversible (or likely to be reversed) or irreversible, permanent or temporary?
- How difficult would it be to offset or remedy any damage?

Appendix 2 lists some key sources of information about ecological features.

Appendix 3 gives more information on describing the condition of ecological features.

Where information about the ecological features is unavailable or unsatisfactory, Planning Authorities should be asked to consider how they could improve it for use in future assessments.

Characterisation of the current state of the ecological features likely to be affected by the RSS or LDD should highlight environmental problems or issues associated with the cumulative effects which should be considered in the environmental assessment of the RSS or LDD. These should be reflected in the Sustainability Appraisal Framework devised by the planning authority which will be used throughout the SA process.

Example:

The study of cumulative effects of development in the Thames Basin Heaths began with a baseline examination of the historical effects of development on biodiversity. This examination showed that the total area of healthland habitat had declined from 196 km^2 to 92 km^2, a difference of 104 km^2, between 1904 and 2003. This is a drop of 53% in the total area of heathland habitat over the last 100 years. This information was illustrated using GIS maps which showed the remaining areas of heathland, and areas where heathland had been lost between 1904 and 2003.

Task 2.3: Describing the evolution of the ecological features and key environmental issues without implementation of the spatial plan

In accordance with the SEA Directive, the SA Report must set out the likely evolution of the environment without implementation of the RSS or LDD. This process should highlight those cumulative effects which are likely to arise even without implementation of the RSS or LDD and help to focus the environmental assessment on the likely significant cumulative effects of the RSS or LDD.

The SA Scoping Report should include predictions of the likely change in the current state of the environment without implementation of the RSS or LDD. These may be based on trend information collected as part of Task 2.2. However, predictions will also need to take account of how other policies, plans, programmes and development projects may influence this evolution, including their likely cumulative effects. Some of this information may be available in environmental assessment reports prepared for these other policies, plans, programmes and development projects, for example, Sustainability Appraisal Reports, Environmental Reports, and Environmental Statements.

Predictions do not have to be expressed in quantitative terms. Hard data may enable Planning Authorities or expert advisers to make detailed quantitative predictions, but quantification is not always practicable, and broad-based and qualitative predictions can be equally valid and appropriate. As in current practice, these may be expressed in easily understood terms such as "getting better or worse" or a scale from ++ (very positive) to – – (very negative).

However, qualitative should not mean "guessed". Predictions should be supported by evidence, such as references to any research, discussions or consultation which helped those carrying out the assessment to reach their conclusions. The Scoping Report should document any uncertainties or limitations in the information underlying both qualitative and quantitative predictions. Assumptions for instance about underlying trends or details of policies or projects to be developed under other policies, plans and programmes, should be clearly stated.

Figure 3.7 is an example of how the likely evolution of the ecological features (that may be affected by the RSS or LDD), without implementation of the spatial plan, can be presented.

Ecological Feature	Current State	Other polices, plans, programmes and development projects which may effect the ecological feature	Potential causes of change arising from other policies, plans, programmes and development projects	Likely effects of other policies, plans, programmes and development projects	Likely evolution of the ecological feature without the proposed RSS or LDD	Comments / Assumptions
Heathland habitat						
Nightjar						
Ancient Woodland						
Badgers						

Figure 3.7 Example of a tabular presentation of the likely evolution of the current state of the environment without implementation of an RSS or LDD

Task 2.4: Developing the cumulative effects assessment process

The SA Scoping Report should set out the scope and level of detail of the SA to be conducted, including information on how the cumulative effects of the RSS or LDD will be assessed. Cumulative effects assessment should be an integral part of the overall environmental assessment and integrated at each stage in the assessment process.

Planning authorities should set out how the SA is to be conducted and as far as practicable, how the significance of cumulative effects will be judged. Where appropriate, English Nature staff should provide advice on the process for assessing the cumulative effects of the RSS or LDD based on the approach described in Stage 3 below.

3.3 Stage 3 – assessing the cumulative effects

Stage 3 checklist

- Have all the likely cumulative effects been identified?
- Have all the ecological features that are likely to be affected by these cumulative effects been identified?
- Are the judgements made in relation to the likely significance of the cumulative effects sound and based on the most up-to-date research and baseline information?
- Have all the other relevant policies, plans, programmes and development projects that may affect the same ecological features been identified and their likely effects taken into account?
- Are there other reasonable alternatives or mitigation measures that should have been considered which could reduce any adverse cumulative effects and increase the positive cumulative effects?
- Have proposals for monitoring the cumulative effects been set out?

Regional Planning Bodies (RPBs) and Local Planning Authorities (LPAs) must consult the public and Consultation Bodies on a full SA Report alongside consultation on the draft RSS, on the preferred options for a DPD, and on a draft SPD prior to submission to the Secretary of State for examination and/or adoption. The SA Report will need to comply with the

requirements of the SEA Directive for an Environmental Report. It should clearly show that the Directive's requirements in relation to the Environmental Report have been met, through sign-posting the place or places in the SA Report where the information required by the Directive is provided.

The SA Report should include information collected during the scoping stage of the SA as well as information on the predicted cumulative effects of the RSS or LDD and their significance, mitigation measures to maximise the beneficial effects and minimise adverse effects, and proposals for monitoring.

The purpose of this consultation is to enable the Consultation Bodies to express their opinion on the draft RSS or LDD and the accompanying SA Report. In responding to consultations on the SA Report and draft RSS or LDD, English Nature should provide planning authorities with advice on whether they agree or disagree with the predicted cumulative effects identified and the judgements made regarding the significance of these effects, whether other reasonable alternatives or mitigation measures should be considered and whether changes to monitoring proposals are needed.

Task 3.1: Predicting the likely cumulative effects of the spatial plan, including alternatives

The purpose of this task is to predict the likely cumulative effects of the RSS or LDD. The SA Report prepared by the Planning Authority should quantify these predicted effects where possible, or provide a subjective judgement where this is not possible, with reference to evidence.

Assessment of cumulative effects should be focused on the ecological features likely to be affected, and the likely significant effects of the RSS or LDD as well as other relevant policies, plans, programmes or projects. The work already carried out through the preliminary review and scoping stages should provide an understanding of the capacity of the receiving environment including whether critical thresholds have been or are close to being breached.

Prediction of cumulative effects should involve:

- Identifying the cumulative changes to the current state of the environment which are predicted to arise from the RSS or LDD itself as well as together with the likely effects of other relevant policies, plans, programmes and projects. These can be compared with the likely evolution of the environment without the RSS or LDD identified during Stage 2.3.
- Describing these changes in terms of their magnitude, their geographical scale, the time period over which they will occur, whether they are permanent or temporary, positive or negative, probable or improbable, and frequent or rare.

In predicting the likely cumulative effects of the RSS or LDD Planning Authorities should identify the cause-effect relationship between the RSS or LDD and the ecological features likely to be affected. Some of this work will have been undertaken as part of Task 2.1 which includes some recommended approaches to establishing these cause-effect relationships (See **Figures 3.2, 3.3 and 3.4**).

Example:

By looking at the Structure Plan allocations and making an adjustment for those allocations falling within the Thames Basin Heaths area, it has been calculated that over the next 12 years a total of 35,170 houses will need to be built within the Thames Basin Heaths, equivalent to at least 12 km^2 lost to housing development. This combined with infrastructure developments identified in the Ten Year Transport Plan, the 'Fleet Eastern Bypass', and expansion of facilities at Farnborough Airport suggests that at a minimum 1,800 hectares of Thames Basin Heaths will be lost to development over the next 12 years, equivalent in size to 25% of the Special Protection Area.

Appendix1 gives a checklist of cumulative effects that may arise as a result of certain types of development. **Figure 3.8** also gives a range of methods for identifying likely cumulative effects which may be helpful in developing conceptual models, tables and diagrams.

When providing advice on techniques consider:

- Ability to organise, analyse and present information.
- Stage of the assessment (eg screening, scoping, baseline information collection, analysis, reporting).
- Types of issues involved and cumulative effects being examined.
- Quality and extent of baseline information.
- Level of expertise available.

Method	Description	Advantages	Disadvantages
Questionnaires, interviews and panels	Useful in gathering the wide range of information on multiple actions and ecological features needed to address cumulative effects. Brainstorming sessions, interviews with knowledgeable individuals and group consensus building activities can help identify the important cumulative effects in the area.	Flexible and able to deal with subjective information.	Cannot quantify effects and comparison of options is subjective.
Checklists	Identify potential cumulative effects by providing lists of common or likely effects and juxtaposing multiple actions and resources. This can be seen as a shortcut to scoping.	Systematic and concise.	Can be inflexible and do not address interactions or cause–effect relationships.
Matrices	Matrices use a tabular format to organise the interactions between human activities and resources of concern.	Provides good visual summary and can be used to identify and assess effects to some degree.	Can be complex and cumbersome and do not address cause–effect relationships.

Method	Description	Advantages	Disadvantages
Causal Chain / Network / Systems analysis	Helps to identify the cause–effect relationships resulting in cumulative effects using flow diagrams. Allows the user to analyse the multiple effects of various actions and trace indirect effects on resources that accumulate from direct effects on other resources.	Facilitate conceptualisation of cause–effect relationships and identify direct effects.	No spatial or temporal scale and diagrams can be complex and cumbersome.
Modelling	An analytical tool which enables the quantification of cause-effect relations which result in cumulative effects by simulation of conditions.	Addresses cause–effect relationships and gives quantified results. Geographic boundaries and time-frames are usually explicit.	Needs a lot of time and data and extrapolation is still largely subjective. Can be difficult to adapt some models to a particular situation.
Trends analysis	Assesses the status of a resource, ecosystem, human community, or economy over time and usually results in graphical projection of past or future conditions. Changes in the occurrence or intensity of stressors over the same time period can also be determined. Trends can help the analyst identify cumulative effects, establish appropriate baselines or project future cumulative effects.	Addresses accumulation over time and helps to identify problems.	Needs a lot of data and extrapolation is still largely subjective.
Overlay mapping and GIS	Used to identify where effects may occur. Can superimpose effects on ecological features or resources to establish where effects may be significant.	Flexible and easy to update. Can consider multiple projects and past, present and future options. Allows clear visual presentation.	Can be expensive and time consuming and difficult to quantify effects.
Expert Opinion	A way of identifying and assessing effects. Expert panels can be formed to facilitate exchange of information and to express views on cumulative effects.	Particularly useful where other methods are not available but significant cumulative effects are considered likely.	Relies on experts - may affect transparency or acceptance of the assessment process.
Carrying Capacity & Threshold Analysis	Based in recognition that thresholds exist and that cumulative effects can result in thresholds being exceeded.	Useful in addressing accumulation of effects against thresholds and considering trends.	It is not always possible to establish the threshold or carrying capacity for a particular resource or ecological feature.

Figure 3.8 Methods for identifying cumulative effects (adapted from US CEQ 1997)

Previous studies on a particular effect or type of ecological features can be useful in developing conceptual models as well as in describing the likely cumulative effects, for example Peterkin's work in 2002 on *Reversing the habitat fragmentation of British Woodlands* and *English Nature'Research Reports*, No 178 on The significance of secondary effects from roads and road transport on nature conservation. Previous studies, including EIAs, monitoring reports, surveys, and trend data, can also provide useful evidence for identifying and describing the magnitude of likely effects. The sensitivity of the ecological feature to the likely effects will be important in predicting the likely magnitude of the effect.

Example:

Noise is known to have an adverse effect on bird densities. Recent studies in the Netherlands indicate that the effects of road traffic on breeding bird density are due to noise emissions rather than visibility or air pollution.

English Nature staff should form a view on whether the predicted cumulative effects are valid. Predictions of the likely evolution of the ecological features do not have to be expressed in quantitative terms, qualitative predictions can be equally valid and appropriate. However, qualitative should not mean "guessed". Predictions should be supported by evidence, such as references to any research, discussions or consultation which helped those carrying out the assessment to reach their conclusions.

As suggested in Task 2.3, predictions may be expressed in easily understood terms such as "getting better or worse" or a scale from ++ (very positive) to – – (very negative) and healthy, stable or poor. Certain effects, such as habitat loss, noise or water pollution, may be easier to quantify than others, for example fragmentation or habitat resilience. Uncertainties or limitations in the information underlying both qualitative and quantitative predictions should be documented.

Figure 3.9 gives an example of how the accumulation of effects of a spatial plan can be presented to highlight significant cumulative effects. This table is useful in considering the effects of the RSS or LDD as a whole rather than as individual components.

Policy No.	SA objective A: Maintain and enhance biodiversity	Commentary on significant cumulative effects (including recommendations for improvement)
Policy 1 (eg road improvement)	-	New road likely to affect woodland.
Policy 2 (eg Traffic management scheme)	+	Reduced traffic on local roads should reduce existing effects of traffic.
Policy 2 (eg Housing proposal)	-	New housing likely to affect woodland through introduction of exotic species and pet predation of woodland species.
Etc.		
Cumulative effects of Policy 1 + 2 + 3 + etc.	- -	The combined effect of new roads plus housing developments will significantly fragment an area of continuous woodland. Recommend redistributing land allocations to reduce effects and incorporating mitigation criteria to minimise adverse effects.

Figure 3.9 Assessing the cumulative effects of spatial plan policies against sustainability objectives

Overlaying mapping using a GIS is also a useful way of highlighting which ecological features are likely to be affected by the cumulative effects of a RSS or LDD. Planning Authorities should be encouraged to adopt this approach where practicable. The likely effects of other policies, plans, programmes and development projects can also be overlaid to highlight cumulative effects.

Example:

The aggregate of cumulative effects identified on Thames Basin Heaths include:

- An allocation of housing and other infrastructure over the next 12 years equivalent to 1,800 hectares of new development which may lead to further isolation of heathland areas and greater pressure along their boundaries.
- Exceedance of critical levels of acidity across the Special Protection Area as a result of sulphur and nitrogen deposition.
- 31% of the area adversely affected by nutrient enrichment as a result of nitrogen deposition, primarily from roads and industry.
- 33% of the area affected by noise (from roads) to the extent that bird densities are likely to be reduced.
- 10% of the area adversely affected by domestic cat predation of ground nesting birds.
- GIS mapping can be used to highlight and calculate the areas affected. Taken together, these figures indicate a habitat under significant pressure.

Task 3.2: Assessing the likely cumulative effects of the spatial plan, including alternatives

Assessing the significance of cumulative effects on ecological features and biodiversity needs to be both defensible and robust, with an explanation of how the decision was reached. Thus the criteria for determining the significance of cumulative effects must be transparent. English Nature staff may provide advice to Planning Authorities on the suitability of criteria for assessing the significance of cumulative effects on biodiversity and on the judgements made regarding the significance of the predicted effects.

Assessment of the significance of cumulative effects should be based upon the characteristics of the effects and the sensitivity of the ecological feature. The techniques for weighting and balancing the relative magnitude of effects and the sensitivity of the ecological features on significance will vary from effect to effect. The significance of cumulative effects must also be considered within the context of the likely effects of other policies, plans, programmes and projects.

Evaluation of significance for any specific effect may be based on:

- Comparison with regulations or standards.
- Exceedance of thresholds.
- Reference to criteria such as protected species, protected sites, landscapes and others which highlight the relative importance or rarity of ecological features (eg Red Data Book species, UK priority habitats and species etc).

- Consultation with consultees and decision makers.
- Compliance with various objectives.
- Comparison with studies or similar spatial plans elsewhere.
- Experience and professional judgement.

Appendix 4 gives further information on identifying criteria and thresholds which may be considered in making judgements about the significance of effects on ecological features. In assessing the significance of the cumulative effects of a RSS or LDD the relative contribution of effects of other policies, plans, programmes, and projects and the degree of existing disturbance and the natural background variability should be taken into account.

The predicted cumulative effects of the RSS or LDD and their significance should be presented together with and as a component of the overall effects of the RSS or LDD. **Figure 3.10** provides an example of tables that can be used to present the likely effects of an RSS or LDD. It is important that the underlying assumptions and data behind the judgements made in completing these types of tables are recorded to provide a decision record or audit trail (for example, assumptions relating to the magnitude and significance of effects and the likely effects of other policies, plans, programmes and projects).

Task 3.3: Mitigating adverse cumulative effects and maximising beneficial cumulative effects

Where a RSS or LDD is likely to have significant adverse cumulative effects on ecological features, measures should be considered to prevent, reduce or offset these effects. Where possible, measures to maximise the positive cumulative effects of RSSs or LDDs should also be considered. These measures are referred to in this toolkit as "mitigation measures", but in the context of spatial plans this should be understood to include proactive avoidance of adverse effects as well as actions taken after effects are noticed. Recommendations for mitigating significant adverse cumulative effects, and improving positive cumulative effects should be included in the SA Report prepared by the Planning Authority. English Nature may provide advice on the suitability of mitigation measures and, where appropriate, other reasonable alternatives which should be considered.

Mitigation can take a wide range of forms, including:

- Changes to the RSS or DPD as a whole or options concerned, including bringing forward new options, or adding or deleting options.
- Refining options, in order to improve the positive cumulative effects and to minimise adverse cumulative effects (eg by strengthening policy criteria).
- Technical measures to be applied during the implementation stage eg buffer zones, application of design principles.
- Identifying issues to be addressed in project environmental impact assessments for certain projects or classes or projects (eg mitigation and compensation measures).
- Proposals for changing other policies, plans and programmes.
- Contingency arrangements for dealing with possible adverse cumulative effects.

The concept of 'no net loss' is often used to help define the scope of mitigation measures. In essence it requires replacing any lost or damaged habitat with habitat of equal quality, although this may not always be practicable. For example, some habitats take several years, and in the case of ancient woodland, hundreds of years, to develop. English Nature may provide advice on mitigation measures to help Planning Authorities achieve a 'no net loss' outcome during implementation of their spatial plans.

Task 3.4: Developing proposals for monitoring cumulative effects

The significant cumulative effects of implementation of the RSS or LDD must be monitored to identify any unforeseen adverse effects and to enable appropriate remedial action to be taken (though the SEA Directive does not create obligations concerning remediation). Planning Authorities must devise proposals for monitoring the cumulative effects of implementing their spatial plans. English Nature staff may advise on the suitability of these monitoring proposals.

Monitoring should allow the actual cumulative effects of the RSS or LDD to be tested against those predicted in the SA. It should help to ensure that problems which arise during implementation, whether or not they were foreseen, can be identified and future predictions made more accurate. Monitoring can also be useful in filling any important environmental information gaps, reduce uncertainties and test the accuracy of predictions.

Monitoring cumulative effects should be focussed on monitoring the state of the ecological features likely to be affected by the RSS or LDD. It should involve measuring indicators which establish a causal link between implementation of the RSS and LDD and the cumulative effects being monitored. Monitoring should be established in a way that takes account of external factors, such as other policies, plans, programmes and projects, and focuses upon the links between the RSS or LDD and the cumulative effect. Where it is difficult to establish these links it may be necessary to collect further information on the RSS or LDD output indicators (e.g emissions).

Sustainability objective	**Summary baseline situation / targets** (incorporating cumulative effects of other policies, plans programmes, and development projects)	**Predicted effects**					**Justification for assessment, noting**: • Likelihood/certainty of effect occurring (high/med/low) • Geographical scale of effect. • Whether temporary or permanent. • Assumptions made. **Include recommendations for mitigation/improvement**
		Indicator	**Nature of effect** (quantify where possible)	**Assessment of effect** (see key below)			
				Short term	**Med term**	**Long term**	
To maintain & enhance biodiversity	Surveys of native species at risk, including protected species, indicate that current populations are sustainable and stable. There has been some decline amongst species listed as priorities in the Local Biodiversity Action Plan. This is expected to continue partially due to the construction of new roads as identified in the Local Transport Plan.	Native species at risk, especially protected species	Minor effect.	**0**	**-**	**-**	Some brownfield sites are proposed for regeneration for employment uses. No research has been undertaken to determine the biodiversity values of these sites. • Likelihood/certainty: low/uncertain • Scale: Three sites • Temporary or permanent: permanent • Timing: Medium to long term Recommendation: consider incorporating criteria to ensure that the value of biodiversity on brownfields sites is considered in the planning application process.
Etc.							
Summary appraisal against objectives				**0**	**0**	**--**	Will provide for a significant increase in jobs that are likely to meet the skills base of the towns' populations, but lack of consideration of the biodiversity values of brownfield sites means that adverse effects on biodiversity and ecosystems may occur.

Figure 3.10 Example matrix for documenting the appraisal of a spatial planning policy, incorporating appraisal of cumulative effects – strategic employment areas

Planning authorities should consider how they could react if monitoring reveals adverse cumulative effects. Certain legislation or policies may require action on the part of either the Planning Authority or another body (although the SEA Directive itself does not create new obligations on environmental protection). Details of any contingency arrangements could be included in the mitigation measures set out in the SA Report.

In responding to consultations on SA Reports accompanying RSSs or LDDs, English Nature should provide advice on the suitability of indicators for monitoring cumulative effects. Monitoring measures must be clearly linked to the SA process, for example:

- The objectives, targets and indicators that were developed for the SA Framework
- Features of the baseline that will indicate the cumulative effects of the RSS or LDD
- The likely significant cumulative effects that were identified during the effects assessment
- The mitigation measures that were proposed to offset or reduce significant adverse cumulative effects or maximise positive cumulative effects.

It is not necessary for Planning Authorities to monitor everything or monitor an effect indefinitely. Instead monitoring should be focussed on:

- Significant cumulative effects that may give rise to irreversible damage, with a view to identifying trends before such damaged is caused
- Significant cumulative effects where there was uncertainty in the SA and where monitoring would enable preventative or mitigation measures to be taken

While planning authorities are responsible for monitoring the effects of their RSSs and LDDs, English Nature should also consider how monitoring being conducted by the agency may be useful to Planning Authorities in monitoring the cumulative effects of implementing RSSs and LDDs.

Appendix 4 gives information on assessing the condition of ecological features. This includes suggestions on possible indicators for monitoring the condition of these ecological features.

Figure 3.11 shows a possible format for documenting proposals for monitoring cumulative effects.

What needs to be monitored (ecological feature /effect)?	What sort of information is required (indicator)?	Where can the information be obtained (sources of information)?	When should monitoring be carried out (dates and frequency)?	When should remedial action be considered?	What remedial action could be taken?

Figure 3.11 Documenting proposals for monitoring cumulative effects

Proposals for monitoring cumulative effects should be incorporated with the overall proposals for monitoring the effects of implementing the RSS or LDD.

4 Assessing the cumulative effects of development projects

This section provides a detailed approach to considering the cumulative effects of development projects. In the context of the spatial planning system, 'development' means the carrying out of building engineering, mining or other operations in, on, over, or under land, or the making of any material change in the use of any buildings or land. In considering the possible cumulative effects of development projects, the full life-cycle of the development must be considered, including construction, operation, and demolition or decommissioning phases.

English Nature must be consulted by both developers and LPAs on certain permitted development projects and planning applications. These consultations provide opportunities for English Nature to ensure that the cumulative effects of development are taken into account in decisions relating to development projects.

Consultations relating to permitted development

The Town and Country Planning (General Permitted Development) Order 1995 (GPDO) grants a general planning permission for the types of development set out in Schedule 2 of the GPDO. These permitted development rights largely apply to developments which are non-contentious and in effect grant deemed planning permission. However Habitat Regulation 60 (Habitat Directive Article 6) requires that English Nature is consulted in circumstances where a permitted development is likely to affect a European site, alone or in combination with other plans or projects, and is not directly connected with or necessary to the management of the site. There are two stages at which English Nature may be consulted:

- A developer may obtain the opinion of English Nature as to whether it considers any particular permitted development would be likely to have a significant effect on a European site. Where English Nature has sufficient information to provide an opinion, it should notify the developer and the LPA within 21 days of receipt of all necessary information. If the information is inadequate or incomplete, English Nature will advise on additional information requirements.
- The LPA will consult with English Nature in preparing an Appropriate Assessment of the implications of a proposal for a site's conservation objectives.

English Nature must also be notified before the development is undertaken, where a development project is listed in the SSSI notification as one that would constitute an operation likely to damage the nature conservation interest features of the site (Sections 28(E) and 28(H) of the Wildlife and Countryside Act 1981).

Consultations relating to planning applications

Those developments not included in the GPDO require planning permission to be granted before they may commence. This permission may be granted following submission of a planning application.

Planning applications in England can be described as either ‘minor applications’ or ‘major applications’. Minor applications are those which are not classified as major applications and include smaller scale ‘householder applications’. Major applications include:

- the erection of 10 or more dwellings, or, if this is not known, where the site area is 0.5 hectares or more;
- where the floorspace to be created is 1,000 square metres or more, or the site area is 1 hectare or more;
- the winning and working of minerals or the use of land for mineral working deposits;
- all waste developments, meaning any development designed to be used wholly or mainly for the purposes of treating, storing, processing or disposing of refuse or waste materials.

Planning applications can be further described as ‘outline’ applications and ‘full’ applications. Outline planning permission gives the applicant permission in principle to carry out development subject to reserve matters which will be decided at a later stage. A grant of outline planning permission enables a developer to proceed with the preparation of detailed plans with the security that they will not be opposed in principle and so represent an important stage in the granting of full planning permission. Full planning permission constitutes approval of the development.

On this basis, planning applications can be classified as four main types:

- Outline minor applications.
- Outline major applications.
- Full minor applications.
- Full major applications.

English Nature may be consulted either before a planning application is lodged (ie during pre-application discussions) or once a planning application has been made, or both. LPAs must consult English Nature before making a decision on whether to grant planning permission where a development project:

- Is likely to damage a SSSI, even if the development is not located in the SSSI – These consultations will involve a single stage of consultation on a planning application for a minimum period of 28 days.
- Is likely to significantly affect a European site designed under the Habitats Regulations, and which is not directly connected with or necessary to the management of the site – These will involve a single stage of consultation on an Appropriate Assessment.
- Falls within Schedule 1 or Schedule 2 of the EIA Regulations – These consultations may involve three stages, only the last of which is mandatory in every case: consultation on a screening decision as to whether an EIA is required; consultation on the scope of the EIA to be conducted, for a period of 5 weeks; and consultation on a full Environmental Statement, for a minimum period of 14 days. Planning applicants may also conduct informal consultation with English Nature throughout the EIA process.

Development projects which fall within Schedules 1 or 2 of the EIA Regulations and which are likely to significantly affect a European site designated under the Habitats Regulations will require both an EIA and an Appropriate Assessment. The findings of these assessments may be integrated into a single Environmental Statement. English Nature is likely to be consulted on these as part of a single assessment process.

Occasionally English Nature may also be consulted by either developers seeking information as part of a planning application not affected by the provisions identified above, or by LPAs looking for advice on planning applications affecting a local nature reserve (LNR), a site of importance for nature conservation (SINC) or other locally designated sites. These provide further opportunities to advise on the likely cumulative effects of development projects.

Assessing the cumulative effects of development projects

Figure 4.1 sets out three key stages in understanding how the cumulative effects of development projects can be considered by English Nature staff in their responses to permitted development projects and planning applications.

Stages when English Nature may be consulted during the assessment of permitted developments or planning applications	**Stages and tasks in assessing cumulative effects**	**Questions to be considered by English Nature**
Screening	**Stage 1: Preliminary Review**	
Permitted Development: Deciding if an Appropriate Assessment is required Planning Application: Deciding if an environmental assessment is required, including an Appropriate Assessment or an EIA.	1.1: Describing the development project	Has English nature been provided with a description of the proposed development project? Does this description include: A plan of the site and location A plan of the proposed development project A description of the development project's proposed use
	1.2: Identifying the types of cumulative effects that may arise	What are the types of cumulative effects that could arise from the development project?
	1.3: Deciding if an assessment of cumulative effects should be conducted	Are these cumulative effects likely to be significant?
Scoping the Assessment	**Stage 2: Scoping the Assessment**	
Permitted Development: Deciding on the scope and level of detail of the Appropriate Assessment Planning Application: Deciding on the scope and level of detail of the environmental assessment to be conducted, including scope and level of detail of an EIA and/or an Appropriate Assessment.	2.1: Identifying the ecological features likely to be affected	Have all the potential types of cumulative effects that may arise been identified? Has the potential spatial and temporal scale of the potential cumulative effects been identified to ensure the assessment area is adequate?
	2.2: Describing the current state of the ecological features and identifying key environmental issues	Have all the ecological features that could be affected by these cumulative effects been identified and their current condition described.

Stages when English Nature may be consulted during the assessment of permitted developments or planning applications	Stages and tasks in assessing cumulative effects	Questions to be considered by English Nature
	2.3: Describing the evolution of the ecological features without implementation of the development project	Has the likely evolution of the ecological features that could be affected, without implementation of the development project, been described, taking into account the potential effects of other relevant policies, plans, programmes and development projects?
	2.4: Developing the cumulative effects assessment process	Has the process for assessing the likely cumulative effects of the development project been described?
Assessing the Development Project	**Stage 3: Assessing the Cumulative Effects**	
Permitted Development: Preparation of the Appropriate Assessment Planning Application: Preparation of environmental assessment reports, including an Appropriate Assessment and/or an Environmental Statement if required	3.1: Predicting the likely cumulative effects of the development project, including alternatives	Have all the likely cumulative effects been identified? Have all the ecological features that are likely to be affected by these cumulative effects been identified?
	3.2: Assessing the cumulative effects of the development project, including alternatives	Are the judgements made in relation to the likely significance of the cumulative effects sound and based on up-to-date research and baseline information? Have all the other relevant policies, plans, programmes and development projects that may affect the ecological features been identified and their likely effects taken into account?
	3.3: Mitigating adverse cumulative effects and maximising beneficial cumulative effects, and compensating where necessary	Are there other reasonable alternatives or mitigation measures that should have been considered which could reduce any adverse cumulative effects and increase the positive cumulative effects? Have compensation measures been proposed? If so, is there evidence that they will be effective?
	3.4: Developing proposals for monitoring cumulative effects	Have proposals for monitoring the cumulative effects been set out?

Figure 4.1 Stages in assessing permitted developments and planning applications and cumulative effects assessment stages and tasks

4.1 Stage 1 – preliminary review

Stage 1 checklist

- Has English nature been provided with a description of the proposed development project?
- Does this description include:
    - A plan of the site and location.
    - A plan of the proposed development project.
    - A description of the development project's proposed use.
- What are the types of cumulative effects that could arise from the development project?
- Are these cumulative effects likely to be significant?

The purpose of this stage is to help English Nature staff to decide whether an assessment of cumulative effects should be undertaken as part of a broader environmental assessment of a development project. This is particularly important when a developer is seeking advice as to whether English Nature considers a particular permitted development would be likely to have a significant effects on a European site designated under the Habitats Directive, and as such, whether an Appropriate Assessment should be conducted. However, English Nature may also be consulted on whether an environmental assessment, including an EIA, may be required for development requiring planning permission. For development which may require EIA, this is likely to take the form of an LPA EIA Screening Opinion.

At this early stage in the assessment process there is likely to be limited information available about the potential cumulative effects of the development project. The expert knowledge of English Nature staff will play a key role in deciding if an assessment of cumulative effects should be conducted. In making this decision, English Nature staff should adopt a precautionary approach to ensure that potentially significant cumulative effects are not overlooked.

The process of considering the nature and geographical extent of the development project and its possible effects will also help define the scope and level of detail of any environmental assessment to be conducted, where this is required. This is discussed in more detail in Stage 2.

Task 1.1: Describing the development project

Understanding the nature and scale of the development project is a prerequisite to identifying the types of cumulative effects that may arise and which of these, if any, are likely to be significant.

When consulting English Nature on whether or not a development project is likely to have significant effects, LPAs and developers should provide sufficient information on the development project being proposed. If the information is inadequate or incomplete, English Nature should advise on additional information it requirements.

At a minimum the information provided at this stage should include:

- plans of the site and its location;
- plans showing the proposed development, including all existing and proposed new buildings and infrastructure;
- a description of the proposed use.

For developments which may require EIA, information on the nature and scale of the development project could be provided as part of a LPA's consultation on its EIA Screening or Scoping Opinions.

For developments which may require an Appropriate Assessment or which may affect a SSSI or other nature conservation values of concern to a LPA, this information could be provided as part of a LPA's or developer's consultation on whether an Appropriate Assessment or other type of environmental assessment is required.

Task 1.2: Identifying the types of cumulative effects that may arise

The purpose of this task is to identify the types of cumulative effects that could arise as a result of the proposed development project, drawing on the information from Task 1.1. English Nature officers will already be aware of many environmental issues which may result from the implementation of certain types of development. These will be based on:

- knowledge of common pressures on the environment created by certain types of development;
- earlier experience with the types of effects arising as a result of the development type proposed (eg linear developments, such as roads, are more likely to cause habitat fragmentation, whereas residential development may lead to extensive habitat loss or disturbance);
- knowledge of the important ecological features in the area, and their current condition, which may be affected by the proposed development;
- analysis of tensions or inconsistencies with other policies, plans, programmes and development projects.

Appendix 1 includes a checklist of cumulative effects that may arise as a result of certain types of development. This may be useful in identifying the types of cumulative effects which may arise from a development project.

Task 2.1 provides further advice on identifying potential cumulative effects and methods for doing so.

In particular, English Nature staff should consider the degree to which the development project may contribute to habitat loss, habitat fragmentation, disturbance (eg noise, light, recreation, pet predation etc) and/or pollution (abiotic and biotic). English Nature Report 626 'Going, going, gone? The cumulative effect of land development on biodiversity in England' gives further information on these main types of cumulative effects.

For developments which may require EIA, information on the key environmental issues which will need to be examined as part of an environmental assessment may already be outlined in the LPA's EIA Screening or Scoping Opinions. Similarly this information could be provided by a LPA or developer when English Nature is consulted on the need for an Appropriate Assessment or another type of environmental assessment (eg where a project may affect a SSSI or other nature conservation values of concern to the LPA). This information may help in the identification of potential cumulative effects. English Nature should advise LPAs and developers if further information is required on key environmental issues at this stage.

Task 1.3: Deciding if an assessment of cumulative effects is required

The purpose of this task is to identify the potential for significant cumulative effects to arise, as a result of the proposed development project. This will enable English Nature staff to provide advice on whether an environmental assessment, including an assessment of cumulative effects should be conducted. This task will be particularly important in circumstances where English Nature is being consulted by a developer or a LPA on whether an Appropriate Assessment or an EIA is required.

In deciding if a development project is likely to result in significant cumulative effects English Nature staff should take a precautionary approach to avoid overlooking potentially significant cumulative effects. The following can be used as a guide:

- How resilient are the ecosystems that are likely to be affected (eg are the affected ecosystems sufficiently complex and robust to resist change)?
- Are particularly important elements of the receiving environment affected (eg Natura 2000 sites, Sites of Special Scientific Interest, National Nature Reserves etc)?
- How far is the current environmental situation from any established thresholds or targets (eg dormouse populations can only be sustained in woods of 20 hectares or more, most woodland bird species require at least 10 hectares before they will breed)?

English Nature's views on whether an assessment of cumulative effects is needed should be included in its broader response on the need for an environmental assessment and should set out:

- Any assumptions made about the nature of the development project, including its nature and geographic extent.
- The likely cumulative effects which could potentially occur.
- Whether English Nature considers that the cumulative effects of the development project are likely to be significant and if so why.
- Whether English Nature considers that a more detailed environmental assessment should be undertaken eg an Appropriate Assessment or EIA, and if so, the scope and level of detail of this assessment
- Whether English Nature considers that the cumulative effects of the development project are likely to be significant and if so why.

Where English Nature is being consulted on an EIA Screening Opinion or on the need for an Appropriate Assessment or other type of environmental assessment (eg for development which may affect a SSSI or other nature conservation values of concern to the LPA), the conclusions drawn at this stage should be included in English Nature's response to the consultation.

Task 3.2 and **Appendix 4** give more detail on assessing the significance of cumulative effects.

4.2 Stage 2 – scoping the assessment

Stage 2 checklist

- Have all the potential types of cumulative effects that may arise been identified?
- Has the potential spatial and temporal scale of these cumulative effects been described?
- Have all the ecological features that could be affected by these cumulative effects been identified and their current condition described?
- Has the likely evolution of the ecological features that could be affected, without implementation of the development project, been described, taking into account the potential effects of other relevant policies, plans, programmes and development projects?
- Has the process for assessing the likely cumulative effects of the development project been described?

If it is established that an assessment of cumulative effects should be conducted, English Nature, the LPA and the developer will need to establish the scope and level of detail of the cumulative effects assessment to be conducted, in most cases as part of a broader assessment of the significant effects of the proposed development project.

- For development projects included in Schedules 1 and 2 of the EIA Regulations, English Nature may be consulted on the proposed scope and level of detail of the environmental assessments to be conducted, for example, through consultation on an EIA Scoping Report prepared by the developer or an EIA Scoping Opinion prepared by the LPA.
- For development projects which are likely to have significant effects on a site of European significance, English Nature will need to advise the LPA and/or developer on the information required to conduct an Appropriate Assessment.
- For development projects which may have effects on a SSSI or other nature conservation values of concern to the LPA, English Nature will need to advise the LPA on the information required to establish the scope of environmental effects assessment that should be conducted.

The purpose of this consultation is to enlist the assistance of English Nature in ensuring that there is adequate information available to enable a thorough appraisal of the likely significant effects of the development project, and to ensure that the environmental assessment process is robust and meets the requirements of the EIA Directive and Regulations and/or the Habitats

Directive and Regulations, where these are relevant. This should be a collaborative process whereby English Nature works together with the LPA and developer to identify, and where possible to provide, the information necessary to undertake the environmental assessment.

Task 2.1: Identifying the ecological features likely to be affected

The purpose of this task is to identify the ecological features that are likely to be affected by the development project's cumulative effects. This task includes agreeing the spatial and temporal boundaries for the assessment of cumulative effects with the developer and the LPA.

A development project may have a number of cumulative effects, and these effects may in turn affect a number of ecological features. Some of the potential effects of the development project and the ecological features likely to be affected will have already been identified by English Nature staff as part of Stage 1 of this process. However, a more comprehensive consideration of these may be necessary during this scoping stage.

The links between the development project proposed and its potential effects on the various ecological features can be illustrated using methods that show their cause-effect relationship. **Figures 4.2, 4.3 and 4.4** show how network analysis, tables, and conceptual models can be used to establish this cause-effect relationship. **Appendix 1** gives a checklist of cumulative effects that may arise as a result of certain types of development. It is important to keep in mind that each of the potential cumulative effects could affect one or more ecological features. These various inter-relationships should be reflected in the process of identifying cause-effect relationships.

Development (driver)	Cause of change (pressure)	Ecological feature (state)	Cumulative effect (impact)
Use of land for flood management, transport infrastructure and industrial development.	Clearing of land, road construction and	Wildlife	Habitat fragmentation
Industrial development and increases in traffic volumes.	Greenhouse gas emissions	Worldwide community and wildlife	Climate change
Industrial development and increases in traffic volumes.	Noise generation	Countryside	Loss of tranquillity

Figure 4.2 Example of a table for recording development, causes of change, ecological features and cumulative effects

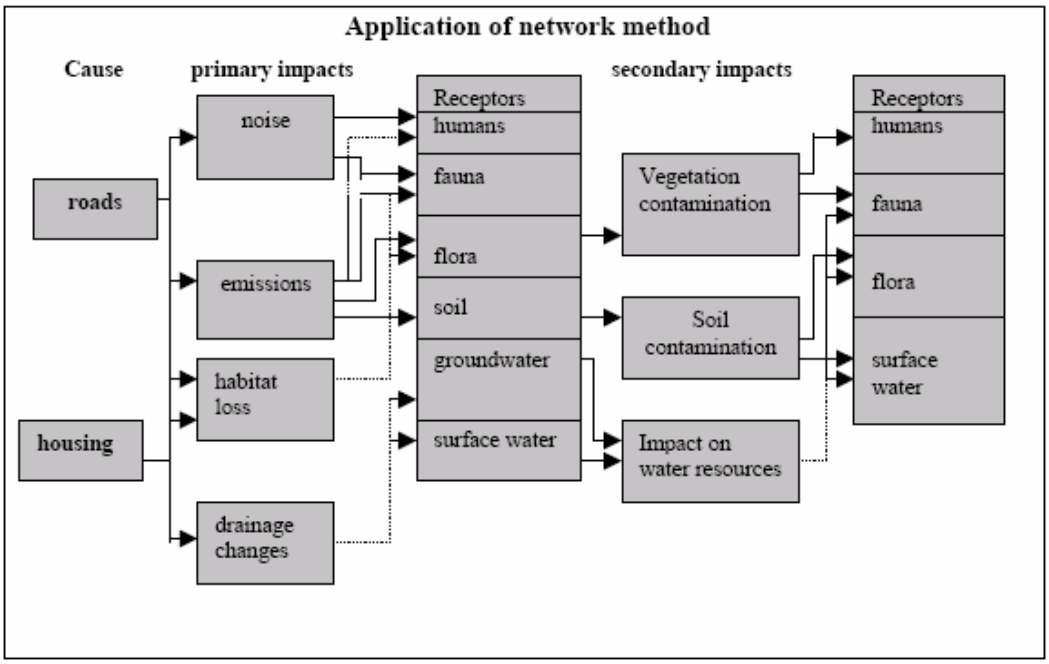

Figure 4.3 Application of network analysis and impact chains (Source Cooper 2003)

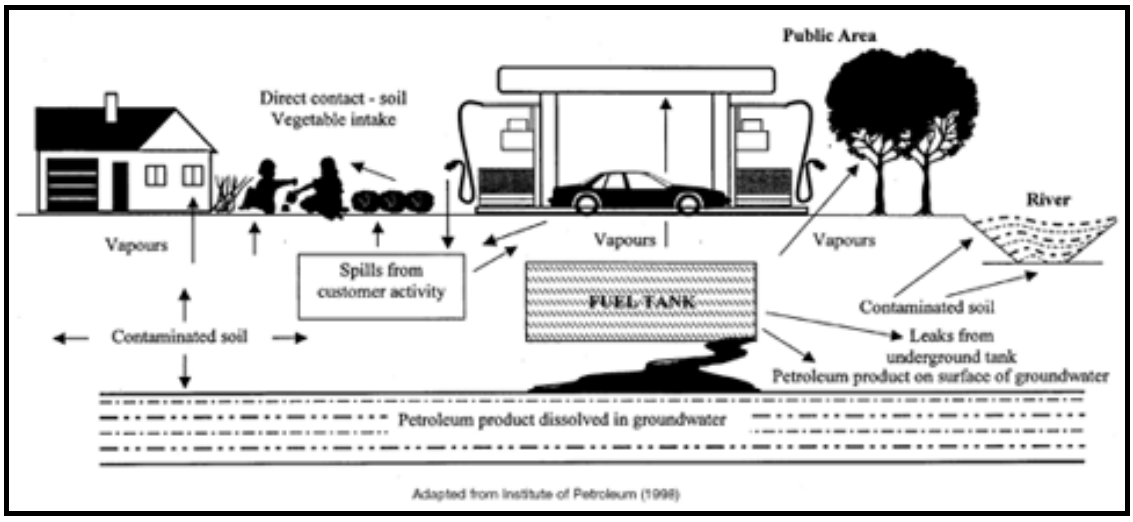

Figure 4.4 Example of a simplified, illustrative conceptual model for the cause and effect relationships of cumulative effects (DEFRA 2000)

Once the potential effects of the development project have been identified the temporal and spatial extent of these effects should be considered to establish an appropriate geographic scope for the assessment and to identify the ecological features within this area which are likely to be affected. The geographical extent of the effects will vary depending on the type of effect, the pathways connecting the source of the effects to the ecological feature, and the sensitivity of the ecological feature. For example, the cumulative effects caused by recreational visits to a nature reserve will depend on the sensitivity of the nature reserve to visitors and on the accessibility of the nature reserve for those visitors.

There may be a need for different geographic boundaries for different effects. These should be based on ecological catchments (eg river basins, natural areas etc) and on the spatial extent of the potential significant cumulative effect. **Figure 4.5** describes an example approach to

establishing the geographic extent of an assessment and the ecological features to be considered.

The *Canadian Environmental Assessment Agency Guidance* (1999) suggests a useful approach for establishing the geographic extent of an assessment and the ecological features to be considered:

- establish a local study area in which the obvious, easily understood and often mitigatable effects will occur;
- establish a (sub-) regional study area that includes the areas where there could be possible interactions with other actions, taking account of the interests of other stakeholders and their policies, plans, programmes and development projects;
- consider the use of several boundaries, one for each ecological feature, as this is preferable to one boundary;
- ensure boundaries are ecologically defensible wherever possible;
- expand boundaries to address the cause-effect relationships between actions and the ecological features;
- ensure boundaries take into account the abundance and distribution of the ecological features at a local, regional and larger scale if necessary (ie for rarer species);
- determine if geographic constraints may limit cumulative effects within a relatively confined area;
- characterise the nature of pathways that describe the cause and effect relationships to establish a line of enquiry;
- set boundaries at a point where cumulative effects become insignificant;
- be prepared to adjust the boundaries during the assessment process if new information suggests this is warranted, and defend any such changes.

Figure 4.5 Example approach to establishing the geographic extent of an environmental assessment and the ecological features to be considered.

Geographic Information Systems (GIS) provide a useful way of mapping both geographic and temporal boundaries and planning authorities should be encouraged to use them. Once mapped the boundaries can provide an area of search or 'catchment'. Other policies, plans, programmes and development projects or ecological features that fall within this catchment can then be considered in the assessment of cumulative effects.

Identifying the ecological features within the area which are likely to be affected is vital for the assessment of cumulative effects. These ecological features will include the more obvious internationally and nationally designated sites but should also include locally designated sites, green infrastructure and links as well as other important ecological features, such as ancient woodland and old hedgerows. **Figure 4.6** sets out an approach to valuing ecological features which can be used as a guide to focus the assessment of cumulative effects on the important ecological features within the area likely to be affected by the development project.

Level of value	Examples
International	• An internationally designated site or candidate site (SPA, pSPA, SAC, cSAC, pSAC, Ramsar site, Biogenetic Reserve) or an area which the country agency has determind meets the published selection criteria for such designation, irrespective of whether or not it has yet been notified. • A viable area of a habitat type listed in Annex 1 if the Habitats Directive, or smaller areas of such habitat which are essential to maintain a viability of a larger whole. • Any regular occurring population of an internationally important species, which is threatened or rare in the UK. ie it is a UK Red Data Book species or listed as occurring in 15 or fewer 10km squares in the UK (categories 1 and 2 in the UK BAP) or of uncertain conservation status or of global conservation concern in the UK BAP. • A regular occurring, nationally significant population/number of an internationally important species.
National	• A nationally designated site (SSSI, ASSI, NNR, Marine Nature Reserve) or a discrete area, which the country conservation agency has determined meets the published selection criteria for national designation (eg SSSI selection guidelines) irrespective of whether or not it has yet been notified. • A viable area of a priority habitat identified in the UK BAP, or of smaller areas such as habitat which are essential to maintain the viability of a larger whole. • Any regularly occurring population of a nationally important species which is threatened or rare in the region or county (see local BAP). • A regularly occurring, regionally or county significant population/number of any nationally important species. • A feature identified as of critical importance in the UK BAP.
Regional	• Viable areas of key habitat identified in the Regional BAP or smaller areas if such habitat which are essential to maintain the viability of a larger whole; • Viable areas of key habitat identified as being of Regional value in the appropriate Natural Area profile; • Any regularly occurring, locally significant population of a species listed as being nationally scarce which occurs in 16-100 10km squares in the UK or in a Regional BAP or relevant Natural Area on account of its regional rarity or localisation; • A regularly occurring, locally significant number of a regionally important species; • Sites which exceed the County-level designations but fall short of SSSI selection guidelines, where these occur.
County / Metropolitan	• Semi-natural ancient woodland greater than 0.25 ha; • County/Metropolitan sites and other sites which the designating authority has determined meet the published ecological selection criteria for designation, including Local Nature Reserves selected on County/Metropolitan ecological criteria (County/Metropolitan sites will often have been identified in local plans); • A viable area of habitat identified on County BAP; • Any regularly occurring, locally significant population of a species which is listed in a County/Metropolitan "red data book" or BAP on account of its regional rarity or localisation; • A regularly occurring, locally significant number of a County/Metropolitan important species.

Level of value	Examples
District / Borough	• Semi-natural ancient woodland smaller then 0.25 ha; • Areas of habitat identified in a sub-County (District/Borough) BAP or in the relevant Natural Area profile; • District sites that the designating authority has determined meet the published ecological selection criteria for designation including Local Nature Reserves selected on District/Borough ecological criteria (District sites, where they exist, will often have been identified in local plans) • Sites/features that are scarce within the District/Borough or which appreciably enrich the District/Borough habitat resource; • A diverse and/or ecologically valuable hedgerow network; • A population of a species that is listed in a District/Borough BAP because of its rarity in the locality or in the relevant Natural Area profile because of its regional rarity or localisation; • A regularly occurring, locally significant number of a District/Borough important species during a critical phase of its life cycle.
Parish / Borough	• Areas of habitat considered to appreciably enrich the habitat resource within the context of the Parish or neighbourhood, eg species-rich hedgerows. • Local Nature Reserves selected on Parish ecological criteria.

Figure 4.6 An approach to valuing ecological features (IEEM 2002)

The environmental report (including an Environmental Statement and/or Appropriate Assessment) prepared by the developer or LPA should describe the nature of the development project and its geographical scope. It should also describe the type of cumulative effects that could arise, the extent of the area that could be affected and the important ecological features within this area that could be affected by the development project.

Task 2.2: Describing the current state of the ecological features and key environmental issues

Some of the ecological features likely to be affected by a development project will already be under stress from various types of existing development and activities while others will be in good condition. For example, Sites of Special Scientific Interest (SSSIs) may or may not be achieving favourable condition. Before the likely cumulative effects of the development project are considered, sufficient information about the current state of the ecological features likely to be affected, including trends, should be collected to allow the effects of the proposed development project to be accurately predicted.

The environmental report should provide information on the current condition of the ecological features which may be affected by the cumulative effects of the development project. For each ecological feature, enough information should be collected to answer the following questions:

- How good or bad is the current situation? How resilient is the ecological feature?
- How far is the current situation from any established thresholds or targets?
- What effects are other policies, plans, programmes or development projects already having effects on the ecological feature? Is it getting worse or better and if so why? What are the existing pressures on the ecological features?

- Are the problems reversible (or likely to be reversed) or irreversible, permanent or temporary?
- How difficult would it be to remedy or offset any damage?

Appendix 2 lists some key sources of information about ecological features.

Appendix 3 gives more information describing the condition of ecological features.

Where information about the ecological features is unavailable or unsatisfactory, additional information should be requested from the developer or the planning authority.

Characterisation of the current state of the ecological features likely to be affected by the development project should highlight environmental problems or issues associated with the cumulative effects which should be considered in the environmental assessment.

Task 2.3: Describing the evolution of the ecological features and key environmental issues without implementation of the development project

The purpose of this stage is to establish the likely evolution of the ecological features, that may be affected by the development project, in the absence of the project. This should highlight those cumulative effects which are likely to arise without implementation of the development project and help to focus the environmental assessment on the likely significant cumulative effects of the project itself.

The environmental report should include predictions of the likely change in the current state of the environment without implementation of the development project. This may be based on trend information collected as part of Task 2.2. However, predictions will also need to take account of how other policies, plans, programmes and development projects may affect this evolution in the future, including their likely cumulative effects. Some of this information may be available in environmental assessment reports prepared for these other policies, plans, programmes and development projects, for example, Sustainability Appraisal Reports, Environmental Reports, and Environmental Statements.

Future development projects should be considered including proposals that have been granted planning permission but have not yet been built, and planning applications that have been submitted or are still at the pre-application stage, for which there is sufficient information to make an assessment. The geographic boundary for each of the cumulative effects established in Task 2.2 should be used to identify which other policies, plans, programmes and development projects are likely to affect the feature.

Information on other policies, plans and programmes within the area likely to be affected by the cumulative may be identified in the review of other plans and programmes included in the Sustainability Appraisal Reports prepared for the relevant RSS and LDD for the area. LPAs will hold information on other relevant development projects within the area, based on their register of planning applications.

Predictions of the likely evolution of the ecological features do not have to be expressed in quantitative terms. Hard data may enable developers, planning authorities or expert advisers to make detailed quantitative predictions, but quantification is not always practicable, and

broad-based and qualitative predictions can be equally valid and appropriate. These may be expressed in easily understood terms such as "getting better or worse" or a scale from ++ (very positive) to – – (very negative) and healthy, stable or poor.

However, qualitative should not mean "guessed". Predictions should be supported by evidence, such as references to any research, discussions or consultation which helped those carrying out the assessment to reach their conclusions. For example, noise and air pollution effects are more likely to be predicted quantitatively than habitat disturbance effects. Uncertainties or limitations in the information underlying both qualitative and quantitative predictions should be documented. Assumptions for instance about underlying trends or details of development projects to be developed under other policies, plans and programmes, should be clearly stated.

Figure 4.7 is an example of how the likely evolution of the ecological features that may be affected by the development project, in the absence of the development project can be presented.

Ecological feature	Current state	Other polices, plans, programmes and development projects which may effect the ecological feature	Potential causes of change arising from other policies, plans, programmes and development projects	Likely effects of other policies, plans, programmes and development projects	Likely evolution of the ecological feature without the proposed development project	Comments / assumptions
Heathland habitat						
Nightjar						
Ancient Woodland						
Badgers						

Figure 4.7 Example of a tabular presentation of the likely evolution of the current state of the environment without implementation of the development project

Task 2.4: Developing the cumulative effects assessment process

Where appropriate, English Nature should seek to influence the scope of the cumulative effects assessment to be undertaken. Ideally this will be achieved through discussions with the developer and the LPA before a request for approval or a planning application has been submitted, although this is not essential. Tasks 1.1 to 2.3 above set out information that should be used to identify the scope and level of detail of an environmental assessment which incorporates the assessment of cumulative effects. Tasks 3.1 to 3.4 recommend how the cumulative effects assessment should be conducted.

Development proposals that require an EIA and/or an Appropriate Assessment are most likely to involve opportunities for English Nature to influence the scope of environmental assessment to be conducted, in some instances through input into the preparation of a Scoping Report or Scoping Opinion. Where appropriate English Nature staff should provide advice on the process for assessing the cumulative effects of the development project based on the approach described in Stage 3 below.

4.3 Stage 3 – assessing the cumulative effects

Stage 3 checklist

- Have all the likely cumulative effects been identified?
- Have all the ecological features that are likely to be affected by these cumulative effects been identified?
- Are the judgements made in relation to the likely significance of the cumulative effects sound and based on the most up-to-date research and baseline information?
- Have all the other relevant policies, plans, programmes and development projects that may affect the same ecological features been identified and their likely effects taken into account?
- Are there other reasonable alternatives or mitigation measures that should have been considered which could reduce any adverse cumulative effects and increase the positive cumulative effects?
- Have compensation measures been proposed? If so, is there evidence that they will be effective?
- Have proposals for monitoring the cumulative effects been set out?

The purpose of this stage is to predict and assess the likely significant cumulative effects of development projects, and to identify appropriate mitigation measures and put forward proposals for monitoring cumulative effects.

At this stage English Nature is likely to be consulted on one of the following:

- an Environmental Statement accompanying a planning application for a development project included in Schedules 1 or 2 of the EIA Regulations;
- an Appropriate Assessment accompanying a request for approval of a permitted development likely to have a significant effect on a European site;
- an environmental report accompanying a planning application which may affect a SSSI or other site of important nature conservation value identified by an LPA.

English Nature may be consulted on a combined Environmental Statement and Appropriate Assessment, in circumstances where a development project falls within Schedules 1 or 2 of the EIA Regulations as well as being development likely to have significant effects on site of European significance.

Consultations at this stage should enable English Nature to express their opinion on the proposed development project and the accompanying environmental assessment. In responding to these consultations English Nature should provide Planning Authorities with advice on whether:

- they agree or disagree with the predicted cumulative effects identified and the judgements made regarding the significance of these effects;
- the request for approval or the planning permission should be granted or if other reasonable alternatives or mitigation measures should be considered;

- changes to monitoring proposals are needed.

Task 3.1: Predicting the likely cumulative effects of the development project, including alternatives

The purpose of this stage is to predict the likely cumulative effects of the proposed development, and its alternatives, on ecological features. The environmental report, Appropriate Assessment or Environmental Statement prepared by the developer or LPA should quantify these predicted effects where possible, or provide an expert judgement, made where this is not possible, with reference to evidence.

Assessment of cumulative effects should be focused on the ecological features likely to be affected, and the likely significant effects of the development project as well as other relevant policies, plans, programmes or projects. The work already carried out through the preliminary review (Stage 1) and scoping (Stage 2) should provide an understanding of the capacity of the receiving environment including whether critical thresholds have been or are close to being breached either now or in the future.

Prediction of cumulative effects should involve:

- Identifying the cumulative changes to the current state of the environment which are predicted to arise from the development project itself as well as together with the likely effects of other relevant policies, plans, programmes and projects. These can be compared with the likely evolution of the environment without the development project identified during Stage 2.3.
- Describing these changes in terms of their magnitude, their geographical scale, the time period over which they will occur, whether they are permanent or temporary, positive or negative, probable or improbable, and frequent or rare.

In predicting the likely cumulative effects of the development project, developers or LPAs should identify the cause-effect relationship between the development project and the ecological features likely to be affected. Some of work will have been undertaken as part of Task 2.1 which includes some recommended approaches to establishing these cause-effect relationships (see **Figures 4.2, 4.3 and 4.4**).

Appendix 1 gives a checklist of cumulative effects that may arise as a result of certain types of development. **Figure 4.8** also gives a range of methods for identifying likely cumulative effects which may be helpful in developing conceptual models and tables. When providing advice on techniques to use consider:

- ability to organise, analyse and present information;
- stage of the assessment (eg screening, scoping, baseline information collection, analysis, reporting);
- types of issues involved and cumulative effects being examined;
- quality and extent of baseline information;
- level of expertise available.

Previous studies on a particular effect or type of ecological features can be useful in developing conceptual models as well as in describing the likely cumulative effects, for example Peterkin's work in 2002 on *Reversing the habitat fragmentation of British Woodlands* and English Nature's Research Report 178 on *The significance of secondary effects from roads and road transport on nature conservation*. Previous studies, including other environmental assessments, monitoring reports, surveys, and trend data, can also provide useful evidence for identifying and describing the magnitude of likely effects. The sensitivity of the ecological feature to the likely effects will be important in predicting the likely magnitude of the effect.

English Nature staff should form a view on whether the predicted cumulative effects are valid. Predictions of the likely evolution of the ecological features do not have to be expressed in quantitative terms, qualitative predictions can be equally valid and appropriate. However, qualitative should not mean "guessed". Predictions should be supported by evidence, such as references to any research, discussions or consultation which helped those carrying out the assessment to reach their conclusions.

As suggested in Task 2.3, predictions may be expressed in easily understood terms such as "getting better or worse" or a scale from ++ (very positive) to – – (very negative) and healthy, stable or poor. Certain effects, such as habitat loss, noise or water pollution, may be easier to quantify than others, for example fragmentation or habitat resilience. Uncertainties or limitations in the information underlying both qualitative and quantitative predictions should be documented.

Overlay mapping using a GIS is also a useful way of highlighting which ecological features are likely to be affected by the cumulative effects of a development project. Developers and LPAs should be encouraged to adopt this approach where practicable. The likely effects of other policies, plans, programmes and development projects can also be overlaid to highlight cumulative effects.

Method	Description	Advantages	Disadvantages
Questionnaires, interviews and panels	Useful in gathering the wide range of information on multiple actions and ecological features needed to address cumulative effects. Brainstorming sessions, interviews with knowledgeable individuals and group consensus building activities can help identify the important cumulative effects in the area.	Flexible and able to deal with subjective information.	Cannot quantify effects and comparison of options is subjective.
Checklists	Identify potential cumulative effects by providing lists of common or likely effects and juxtaposing multiple actions and resources. This can be seen as a shortcut to scoping.	Systematic and concise.	Can be inflexible and do not address interactions or cause–effect relationships.
Matrices	Matrices use a tabular format to organise the interactions between human activities and resources of concern.	Provides good visual summary and can be used to identify and assess effects to some degree.	Can be complex and cumbersome and do not address cause–effect relationships.

Method	Description	Advantages	Disadvantages
Causal chain / network / systems analysis	Helps to identify the cause–effect relationships resulting in cumulative effects using flow diagrams. Allows the user to analyse the multiple effects of various actions and trace indirect effects on resources that accumulate from direct effects on other resources.	Facilitate conceptualisa-ion of cause–effect relationships and identify direct effects.	No spatial or temporal scale and diagrams can be complex and cumbersome.
Modelling	An analytical tool which enables the quantification of cause-effect relations which result in cumulative effects by simulation of conditions.	Addresses cause–effect relationships and gives quantified results. Geographic boundaries and time-frames are usually explicit.	Needs a lot of time and data and extrapolation is still largely subjective. Can be difficult to adapt some models to a particular situation.
Trends analysis	Assesses the status of a resource, ecosystem, human community, or economy over time and usually results in graphical projection of past or future conditions. Changes in the occurrence or intensity of stressors over the same time period can also be determined. Trends can help the analyst identify cumulative effects, establish appropriate baselines or project future cumulative effects.	Addresses accumulation over time and helps to identify problems.	Needs a lot of data and extrapolation is still largely subjective.
Overlay mapping and GIS	Used to identify where effects may occur. Can superimpose effects on ecological features or resources to establish where effects may be significant.	Flexible and easy to update. Can consider multiple projects and past, present and future options. Allows clear visual presentation.	Can be expensive and time consuming and difficult to quantify effects.
Expert opinion	A way of identifying and assessing effects. Expert panels can be formed to facilitate exchange of information and to express views on cumulative effects.	Particularly useful where other methods are not available but significant cumulative effects are considered likely.	Relies on experts - may affect transparency or acceptance of the assessment process.
Carrying capacity & threshold analysis	Based in recognition that thresholds exist and that cumulative effects can result in thresholds being exceeded.	Useful in addressing accumulation of effects against thresholds and considering trends.	It is not always possible to establish the threshold or carrying capacity for a particular resource or ecological feature.

Figure 4.8 Methods for identifying cumulative effects (adapted from US CEQ 1997)

Task 3.2: Assessing the likely cumulative effects of the development project, including alternatives

Assessing the significance of cumulative effects on ecological features and biodiversity needs to be both defensible and robust, with an explanation of how the decision was reached. Thus the criteria for determining the significance of cumulative effects must be transparent. English Nature staff may provide advice to LPAs and developers on the suitability of criteria for assessing the significance of cumulative effects on biodiversity and on the judgements made regarding the significance of the predicted effects.

For an Appropriate Assessment, the test of significance is whether the proposed development project will have an adverse effect on the integrity of a site of European significance in terms of the conservation objectives for which the site was designated, for example species population levels.

Assessment of the significance of cumulative effects should be based upon the magnitude of the effects and the sensitivity of the ecological feature. The techniques for weighting and balancing the relative magnitude of effects and the sensitivity of the ecological features on significance will vary from effect to effect. The significance of cumulative effects must also be considered within the context of the likely effects of other policies, plans, programmes and projects.

Evaluation of significance for any specific effect may be based on:

- comparison with regulations or standards;
- exceedance of thresholds;
- reference to criteria such as protected species, protected sites, landscapes and others which highlight the relative importance or rarity of ecological features (eg Red Data Book species, UK priority habitats and species etc)
- consultation with consultees and decision makers;
- compliance with various objectives;
- comparison with studies or similar spatial plans elsewhere;
- experience and professional judgement.

Appendix 4 gives further information on identifying criteria and thresholds which may be considered in making judgements about the significance of effects on ecological features.

Where a broader assessment of the environmental effects of a development projects has been conducted, the predicted cumulative effects of the development project and their significance should be presented together with and as a component of the broader environmental assessment.

Task 3.3: Mitigating adverse cumulative effects and maximising beneficial cumulative effects

Where a development project is likely to have adverse effects on ecological features, measures should be considered to mitigate these effects. Mitigation measures should avoid overall potential adverse effects on the integrity of a site and should be taken into account in the assessment of the cumulative effects of a development in accordance with the hierarchy of preferred options (listed below in order of priority):

- enhance
- avoid effects at the source(s);
- reduce effects at source(s);
- abate effects on site;
- abate effects at ecological feature;
- repair effects.

Compensation should only be considered if the potential for avoiding and reducing effects though mitigation has been exhausted but the development project is still being considered for consent for reasons of overriding public interest. Compensation measures should provide alternative habitats (or other measures) that offset residual adverse effects remaining after all other attempts to mitigate impacts on the integrity of the ecological feature have been exhausted.

The concept of 'no net loss' is often used to help define the scope of compensation measures. In essence it requires replacing any lost or damaged habitat with habitat of equal quality. The compensatory habitat must be capable of maintaining the coherence of the Natura 2000 network and must become of sufficient quality within a clear timescale.

Recommendations for mitigating significant adverse cumulative effects, and improving positive cumulative effects should be included in the environmental report accompanying the development proposal. Any mitigation measures that are suggested as part of the environmental report will also need to be assessed for their likely cumulative effects.

Task 3.4: Developing proposals for monitoring cumulative effects

The significant cumulative effects of development projects must be monitored to identify any unforeseen adverse effects and to enable appropriate remedial action to be taken. Monitoring allows the actual cumulative effects of the development project to be tested against those predicted in the environmental assessment. It also provides an opportunity to check that the mitigation measures implemented are effective. English Nature staff may advise on the suitability of the monitoring proposals.

Monitoring cumulative effects should be focussed on monitoring the state of the ecological features likely to be affected by the development project. It should involve measuring indicators which establish a causal link between implementation of the development project and the cumulative effects being monitored, taking into account external factors, such as other policies, plans, programmes and projects. Where it is difficult to establish these links it

may be necessary to collect further information on the development projects outputs using output indicators (e.g emissions).

In developing proposals for monitoring LPAs and developers should consider how they could react if monitoring reveals adverse cumulative effects. For example there may be particular legal requirements for maintaining the population levels of species relevant to European sites. Details of any contingency arrangements should be included in the mitigation measures set out in the environmental report and the conditions of any planning permission granted.

In responding to consultations on monitoring proposals, English Nature should provide advice on the suitability of indicators for monitoring cumulative effects. Monitoring measures must be clearly linked to the environmental assessment process, for example targets and indicators used to describe the existing state of the environment and the likely cumulative effects of the development project, as well as indicators for monitoring the effectiveness of mitigation measures.

Monitoring should be focussed on:

- Significant cumulative effects that may give rise to irreversible damage, with a view to identifying trends before such damaged is caused.
- Significant cumulative effects where there was uncertainty in the environmental assessment and where monitoring would enable preventative or mitigation measures to be taken.
- Significant cumulative effects that indicate a likely breach of international, national or local legislation, recognised guidelines or standards.

While LPAs and developers may be responsible for monitoring the effects of the development project, English Nature should also consider how monitoring being conducted by the agency may be useful in monitoring the cumulative effects of the proposed development project.

Appendix 6 gives a list of types of cumulative effects and possible indicators that can be used in monitoring these. The source of these indicators is also provided.

Figure 4.8 shows a possible format for documenting proposals for monitoring cumulative effects.

What needs to be monitored (ecological feature /effect)?	What sort of information is required (indicator)?	Where can the information be obtained (sources of information)?	When should monitoring be carried out (dates and frequency)?	When should remedial action be considered?	What remedial action could be taken?

Figure 4.9 Documenting proposals for monitoring cumulative effects

Proposals for monitoring cumulative effects should be incorporated with the overall proposals for monitoring the effects of the development project.

Monitoring of the cumulative effects of development projects also provides LPAs and English Nature with the opportunity to learn how past developments have affected biodiversity. For example, the results of monitoring the effects of noise disturbance during a development at Saltend on the Humber identified noise levels above and below which different levels of disturbance effects on waterfowl were observed. This information can be used to inform responses to (and potentially the placement of conditions on) future development proposals.

5 Glossary

Appropriate Assessment	An assessment of the implications of a proposal for a European Site in view of the site's conservation objectives.
Baseline	A description of the present and future state of an area, in the absence of any plan, taking into account changes resulting from natural events and from other human activities.
Compensation	Measures taken to offset or compensate for residual adverse effects, which cannot be entirely mitigated. These usually take the form of replacing (or at least trying to) what will be lost eg the relocation of important grassland or heathland habitats from the development site to another area identified as suitable, or the creation of new habitats.
Cumulative Effects	Changes to the environment that are caused by an action in combination with other past, present and future human actions.
Ecological Features	A natural area, habitat or species that could be affected by externally imposed pressures or stresses resulting in a change to their health or condition.
Environmental Appraisal	A form of environmental assessment used in the UK (primarily for development plans) since the early 1990s, supported by *Environmental Appraisal of Development Plans: A Good Practice Guide* (DoE, 1993); more recently superseded by sustainability appraisal. Some aspects of environmental appraisal foreshadow the requirements of the SEA Directive.
Environmental Assessment	Generically, a method or procedure for predicting the effects on the environment of a proposal, either for an individual project or a higher-level "strategy" (a policy, plan or programme), with the aim of taking account of these effects in decision-making. The term "Environmental Impact Assessment" (EIA) is used, as in European Directive 337/85/EEC, for assessments of projects. In the SEA Directive, an environmental assessment means "the preparation of an environmental report, the carrying out of consultations, the taking into account of the environmental report and the results of the consultations in decision-making and the provision of information on the decision", in accordance with the Directive's requirements.
Environmental Impact Assessment	An assessment of the significant environmental effects of a development project conducted in accordance with the requirements of the EIA Directive.
Environmental Report	Document required by the SEA Directive as part of an environmental assessment, which identifies, describes and appraises the likely significant effects on the environment of implementing a plan or programme. See SA Report.
Environmental Statement	A document setting out the developer's assessment of a project's likely environmental effects, prepared and submitted by the developer in conjunction with the application for planning permission.
European Sites	Candidate Special Areas of Conservation (cSAC) and Special Areas of Conservation (SAC) designated pursuant to the Habitats Directive, and Special Protection Areas (SPA) and proposed Special Protection Areas (pSPA) classified under the Birds Directive.
Habitats Directive	European Directive 92/43/EEC on 'on the conservation of natural habitats and of wild fauna and flora'.
Habitats Regulations	The Conservation (Natural Habitats &c.) Regulations 1994

Indicator	A measure of variables over time, often used to measure achievement of objectives. – Output Indicator: An indicator that measures the direct output of the plan or programme. These indicators measure progress in achieving plan or programme objectives, targets and policies. - Outcome Indicator: An indicator that measures the significant effects of the plan or programme. – Contextual indicator: An indicator used in monitoring that measures changes in the context within which a plan or programme is being implemented.
Mitigation	Used in this guidance to refer to measures to avoid or reduce significant adverse effects.
Objective	A statement of what is intended, specifying the desired direction of change in trends.
Planning Authority	Planning authority refers to both Regional Planning Bodies and Local Planning Authorities.
Scoping	The process of deciding the scope and level of detail of an environmental assessment or Sustainability Appraisal, including the environmental effects and options which need to be considered, the assessment methods to be used, and the structure and contents of the environmental report or SA Report.
Scoping Opinion	A scoping opinion is a formal response provided by a planning authority after consultation with the statutory bodies, to a developer in order to outline the scope of the environmental assessment.
Screening	Development proposals undergo the process of screening in order to determine whether or not they require an EIA. The aim of screening is to ensure that those projects, which are likely to have a significant impact on the environment, undergo a formal assessment of their environmental effects.
Screening Opinion	A screening opinion is provided by a planning authority to a developer to ascertain whether an EIA is necessary for a development
SEA Directive	European Directive 2001/42/EC 'on the assessment of the effects of certain plans and programmes on the environment'.
SEA Regulations	The Environmental Assessment of Plans and Programmes Regulations, 2004.
Significant Effects	Effects which are significant in the context of the plan. (Annex II of the SEA Directive gives criteria for determining the likely environmental significance of effects)
Special Protection Areas:	Area designated for protection under the Habitats Directive.
Strategic Environmental Assessment (SEA)	Generic term used internationally to describe environmental assessment as applied to policies, plans and programmes. In this toolkit, 'SEA' is used to refer to the type of environmental assessment required under the SEA Directive.
Sustainability Appraisal (SA)	Generic term used in this toolkit to describe the form of assessment that considers social, environmental and economic effects, which fully incorporates the requirements of the SEA Directive.
Sustainability Appraisal Report	Term used in this toolkit to describe a document required to be produced as part of the SA process to describe and appraise the likely significant effects on sustainability of implementing a plan, which also meets the requirement for the Environmental Report under the SEA Directive.

6 Abbreviations

DPD	Development Plan Document
GDPO	General Development Procedure Order
GIS	Geographic Information System
EIA	Environmental Impact Assessment
LDD	Local Development Document
LPA	Local Planning Authority
RPB	Regional Planning Body
RSS	Regional Spatial Strategy
SA	Sustainability Appraisal
SEA	Strategic Environmental Assessment
SPD	Supplementary Planning Document
SSSI	Site of Specific Scientific Interest

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Appendix 1 – Checklist of the possible cumulative effects of development

Development places a variety of pressures on the environment which in turn have a range of environmental effects. This appendix sets out two matrices which, when used together, can help to identify the cause-effect relationships between different types of development and their potential cumulative effects. **Figure A1.1** gives a list of development types and an indicative list of the potential causes of environmental change which may arise from these. **Figure A1.2** sets out an indicative list of cumulative effects that may arise as a result of these various causes of environmental change. The '✓' symbol identifies which types of development are likely to generate each of the causes of environmental change, and which of these will result in the cumulative effects listed.

By their nature, cumulative effects can be secondary or indirect or they can result from the interaction of various different effects. In identifying the likely significant effects of a development project or spatial plan it will be important to consider how the effects identified below may lead to other secondary, indirect or synergistic effects.

It should also be noted that the matrices only include reference to pressures and effects relating to biodiversity. Cumulative socio-economic effects may also lead to cumulative effects on biodiversity (eg displacement of land uses can lead to impacts on areas of biodiversity value) and this should be taken into account when identifying the likely significant cumulative effects of development.

The matrices provided are indicative only and have been prepared based on the professional experience and expert knowledge of consultants. The validity of the cause-effect relationships reflected in them could be enhanced through a more detailed analysis of environmental assessment reports and other research prepared in relation to the different types of development projects listed. In any case, however, it will not be possible to provide a definitive list of cause-effect relationships as these will vary depending on the nature and characteristics of the locality of the development.

These matrices should be used only as a starting point and should not form the basis of an assessment of the likely cumulative effects of a spatial plan or development project.

Figure A1.3 lists a selection of research on some of the cause-effect relationships between development and environmental effects. These may provide a useful cross-check to the matrices, keeping in mind the need to consider the relevance of the research to the spatial plan or development project proposed and its locality.

Development (drivers) Causes of environmental change (pressures)	Residential	Commercial	Industrial	Waste facilities	Landfill	Mining	Road building	Power stations	Electricity	Sewage Plants	Water	Water	Pipelines	Port	Marina	Leisure	Airport	Windfarms
Land Clearance	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Traffic generation	✓	✓	✓	✓	✓	✓	✓	✓						✓	✓	✓	✓	
Air pollution			✓	✓	✓	✓	✓	✓		✓	✓	✓		✓			✓	
Greenhouse gas emissions	✓	✓	✓	✓	✓	✓	✓	✓		✓	✓	✓	✓	✓	✓	✓	✓	✓
Water pollution	✓	✓	✓	✓	✓	✓	✓	✓		✓		✓	✓	✓	✓		✓	
Light pollution	✓	✓	✓	✓	✓	✓	✓	✓						✓	✓	✓	✓	
Noise pollution	✓	✓	✓	✓	✓	✓	✓	✓		✓	✓			✓	✓	✓	✓	✓
Land contamination			✓	✓	✓	✓	✓			✓		✓	✓	✓	✓	✓	✓	
Incidence of Fire	✓						✓								✓		✓	
Increase in pets	✓															✓		
Water level change	✓	✓	✓	✓		✓	✓	✓	✓	✓	✓	✓		✓		✓	✓	✓
Litter	✓	✓	✓	✓			✓							✓	✓	✓	✓	
Increase in exotic species	✓				✓		✓			✓				✓			✓	
Drainage	✓	✓	✓	✓			✓	✓			✓			✓	✓	✓	✓	
Recreation	✓														✓	✓		
Waste	✓	✓	✓	✓		✓		✓		✓			✓	✓	✓	✓	✓	

Figure A1.1 Checklist matrix setting out some of the causes of environmental change arising from different types of land development

Potential cumulative effects (impacts) **Causes of environmental change (pressures)**	**Loss of habitat**	**Loss of species**	**Reduction of habitat**	**Fragmentation**	**Species disturbance**	**Trampling or Soil compaction**	**Predation**
Land clearance	✓	✓	✓	✓	✓		
Traffic generation		✓	✓	✓	✓		
Air pollution	✓	✓	✓	✓			
Greenhouse gas emissions	✓	✓	✓	✓	✓		
Water pollution	✓	✓	✓				
Light pollution		✓		✓			✓
Noise pollution		✓		✓	✓		
Land contamination	✓	✓	✓	✓			
Incidence of fire	✓	✓		✓	✓		✓
Increase in pets		✓			✓		✓
Water level change	✓	✓	✓				
Litter		✓	✓		✓		✓
Increase in exotic species		✓			✓		
Drainage	✓	✓	✓	✓	✓		
Recreation			✓	✓	✓	✓	✓
Waste		✓	✓				✓

Figure A1.2 Checklist matrix setting out some of the potential cumulative effects that may arise from different causes of environmental change

Sources of data (available at www.english-nature.org.uk or via the English Nature Enquiry Service)
English Nature Research Reports, No. 19: A short bibliography of the fens and aspects of their conservation
English Nature Research Reports, No. 20: Biological indicators of the dehydration and changes to East Anglian fens, past and present
English Nature Research Reports, No. 27: A review of the effects of recreation on woodland soils, vegetation and fauna
English Nature Research Reports, No. 30: East Anglian fens and ground water abstraction
English Nature Research Reports, No. 41: A bibliography of research on woodland NNRs
English Nature Research Reports, No. 55: Pike Whin Bog- decline in water levels
English Nature Research Reports, No. 56: Wannister Bog- decline in watter levels
English Nature Research Reports, No. 60: Linear features, linear habitats and wildlife
English Nature Research Reports, No. 75: The role of corridors, stepping stones and islands for species conservation in a changing climate
English Nature Research Reports, No. 89: Habitat fragmentation: species at risk. Invertebrate group identification
English Nature Research Reports, No. 94: Are habitat corridors conduits for animals and plants in a fragmented landscape? A review of the scientific evidence
English Nature Research Reports, No. 95: Habitat fragmentation and heathland species
English Nature Research Reports, No. 98: An approach to woodland monitoring framework
English Nature Research Reports, No. 178: The significance of secondary effects from roads and road transport on nature conservation
English Nature Research Reports, No. 189: Monitoring raised bogs. Workshop report
English Nature Research Reports, No. 190: Monitoring rehabilitation work on lowland peatlands
English Nature Research Reports, No. 269: The restoration of replanted ancient woodland
English Nature Research Reports, No. 324: Woodland surveillance and monitoring: a discussion paper
English Nature Research Reports, No. 326: habitat restoration project: Ouse Valley link trail area report
English Nature Research Reports, No. 327: Habitat restoration project: renewing the Alde project. Final report for the Suffolk trail area
English Nature Research Reports, No. 345: preparation and presentation of habitat replacement cost estimates. Using examples of the restoration and creation of coastal and floodplain grazing marsh, reedbeds and lagoons
English Nature Research Reports, No. 359: Key habitat attributes for birds and bird assemblages in England
English Nature Research Reports, No. 377: Habitat restoration project: final report
English Nature Research Reports, No. 378: Habitat restoration monitoring handbook
English Nature Research Reports, No. 385: A provisional intervention woodland reserve series for England with proposals for baseline recording and long-term monitoring
English Nature Research Reports, No. 409: review of the value of the published lowland heathland recreation plans in progressing the BDP objectives
English Nature Research Reports, No. 463: Urban development djacent to heathland sites in Dorset; the effect on the density and settlement patterns of bird species. Annex 1

Sources of data (available at www.english-nature.org.uk or via the English Nature Enquiry Service)
English Nature Research Reports, No. 479: development control, local authorities and protected species surveys
English Nature Research Reports, No. 484: Evaluation of development plans to assess biological and geological policy options
English Nature Research Reports, No. 517: assessing the outcome of English Nature advice on bat colony management and mitigation works
English Nature Research Reports, No. 521: Building for biodiversity: A review of outcomes from mitigation, compensation and /or enhancement scheme
English Nature Research Reports, No. 525: Lichens in a changing pollution environment
English Nature Research Reports, No. 536: capturing planning decisions that affect ancient woodland: a pilot study in South east England
English Nature Research Reports, No. 546: Status of the adder and the slow worm in England
English Nature Research Reports, No. 558: The status and distribution of ancient woodland in Dorset. Part 1 details of methods used in updating the status and distribution of Ancient Woodland for English Nature in Dorset
English Nature Research Reports, No. 559: The status and distribution of ancient woodland in Dorset. Part II an analysis of land use changes resulting in the loss of Ancient Woodland
English Nature Research Reports, No. 580: The ecological effects of diffuse air pollution from road transport
English Nature Research Reports, No. 622: Urban impacts on Dorset Heaths: A review of authoritative planning and related decisions
English Nature Research Reports, No. 623: A literature review of urban effects on lowland heaths and their wildlife
English Nature Research Reports, No. 624: Urban impacts on Dorset heathlands: Analysis of the heathland visitor questionnaire survey and the heathland fires incident data sets
English Nature Research Reports, No. 626: Going, going, gone? The cumulative impacts of land development on biodiversity in England
English Nature Research Reports, No. 649: Dogs, access and nature Conservation

Figure A1.3 Sources of information on the potential cumulative environmental effects of land development

Appendix 2 – Sources of information about ecological features

Figure A2.1 lists a selection of sources of information for identifying and describing the ecological features likely to be affected by a spatial plan or development project. English Nature staff will need to consider which of these may be suitable for use for any particular purpose. Where information may be problematic, choices will need to be made on whether to avoid using it, make use of it with an explanation of its limitations, or collect further information to remove uncertainty. Figure A2.1 does not claim to be comprehensive. In particular, regional and county level biological records centres are very useful sources of additional information.

Source of data	Examples of available datasets	Level
Association of Local Government Ecologists www.alge.org.uk	Biodiversity reports and publications	National
Biological Records Centres http://www.brc.ac.uk/	Population, presence and abundance data for UK species	National / Local
Botanical Society of the British Isles www.bsbi.org.uk	British Society for Botanical Information – Flora	National
British Dragonfly Society	Dragonflies	National
British Trust for Ornithology (BTO) www.bto.org	Birds	National
Buglife- The Invertebrate Conservation Trust www.buglife.org.uk	General Invertebrate Information	National / Local
Butterfly Conservation Society www.butterfly-conservation.org	Butterflies	National
Centre for Ecology and Hydrology www.ceh.ac.uk	Terrestrial and freshwater environment	National
English Nature www.english-nature.org.uk http://www.natureonthemap.org.uk/	Information on all designations including SSSI citations and LNR. Designations, Local Authority managed SSSIs etc.	National / Local
Environment Agency www.environment-agency.gov.uk/yourenv	Environmental facts and figures, Environment Agency indicators (air, climate, land, people and lifestyles, pollution, resources and waste, water, wildlife) etc.	Local
Joint Nature Conservation Committee www.jncc.gov.uk http://www.jncc.gov.uk/page-1417 http://www.jncc.gov.uk/page-23 http://www.jncc.gov.uk/page-2133	Natura 2000, habitats, species and marine conservation. JNCC also publishes the British Red Data Books, which list rare and endangered species in the UK	International/ National
Local Biodiversity Action Plans	Population, rarity and trend data on locally important habitats and species	Local
Local Wildlife Trusts and Local Biological Record Centres	Information on biodiversity, flora and fauna for local areas, including non-designated sites of wildlife interest	Local
The Mammal Society http://www.abdn.ac.uk/mammal/	Survey data on mammals	National / Local
National Biodiversity Network www.nbn.org.uk www.searchnbn.net	Habitats and species. Provides access to the network of Local Record Centres as well as other significant biodiversity datasets	National / Local

Source of data	Examples of available datasets	Level
Multi-Agency Geographic Information for the Countryside (MAGIC) http://www.magic.gov.uk/	Provides a variety of environmental data sources in a downloadable GIS format	National / Local
Plantlife www.plantlife.org.uk	Wild plants	National
RSPB www.rspb.org.uk www.rspb.org.uk/science/birdweb England: www.rspb.org.uk/england/index.asp	Bird monitoring and survey work	National / Local
Rural Development Service & Agri-Environment Schemes www.defra.gov.uk/rds/default.asp www.defra.gov.uk/erdp/default.htm	Information on agri-environment schemes	National
Woodland Trust www.woodland-trust.org.uk/	Native woodland heritage	National
British Geological Survey www.bgs.ac.uk	Geology including minerals, unstable land, contaminated land, groundwater etc.	National / Regional / Local
Centre for Ecology and Hydrology www.ceh.ac.uk	Terrestrial and freshwater environmental research	Local
Defra www.defra.gov.uk www.defra.gov.uk/environment/statistics	Inland water quality and use.	Regional
Macaulay Land Use Research Institute (MLURI) www.mluri.sari.ac.uk/	Soil, plants, water	Regional
Soil Resources Institute www.silsoe.cranfield.ac.uk/nsri	Sustainable management of soil and land resources	Local
UK Biodiversity Action Plans http://www.ukbap.org.uk/default.aspx	Population, rarity and trend data on nationally important habitats and species	National
Regional and Local Biodiversity Action Plans (Regional Assembly and Locla Planning Authority websites)	Population, rarity and trend data on regionally and locally important habitats and species and priority actions for protecting and enhancing these.	Regional / Local
Wildlife Trusts http://www.wildlifetrusts.org/	Information on habitats and species	National / Local
Council for the Protection of Rural England (CPRE) http://www.cpre.org.uk/	National trend data maps for noise and light pollution	National
Centre for Ecology and Hydrology www.ceh.ac.uk	Critical load maps for acid and nutrient nitrogen deposition over the UK	National
Air Quality Expert Group (DEFRA) http://www.defra.gov.uk/environment/airquality/aqeg/	Background Nitrogen Dioxide	National
Environment Agency http://www.environment-agency.gov.uk/	Characterisation of the ecological status of all watercourses. Water abstraction data taken from the Catchment Management Abstration Studies.	Local

Figure A2.1 Sources of information about ecological features

Appendix 3 – Assessing the condition of ecological features

Some of the ecological features likely to be affected by a spatial plan or project will already be under stress from various types of existing development and activities, while others will be in good condition. Before the likely cumulative effects of the spatial plan or project are considered, sufficient information about the current state of the environment, including trends, should be collect to allow the likely effects of the spatial plan or project to be predicted.

A healthy ecosystem is one that is free from distress and degradation, maintains its organisation and autonomy over time, and is resilient to stress. Ecosystem health can be assessed by indicators of ecosystem vigour, organisation and resilience. A number of parameters that could be used to describe the health of a terrestrial system, include:

- ecological guilds (that is groups of species that are suspected to respond in a similar way to changes in the environment);
- ecosystem diversity and resilience;
- community dominance (eg stressed ecosystems may be dominated by species with shorter reproductive cycles and/or smaller size);
- non-native species (exotics);
- disease prevalence;
- stability of component populations;
- nutrient cycles;
- other physical, chemical and ecological trends.

Information on the current state of the ecological features likely to be affected by a spatial plan or development project can be obtained through:

- Conducting phase 1 and phase 2 ecological surveys.
- Reviewing existing assessments (eg existing assessments of the current state of SSSIs in England, EIAs, SEAs etc).
- Analysis of trend information (eg trends in wild bird populations give an indication of the health of wildlife).

Care should be taken in using broad-brush approaches to ecological trends to measure ecological condition. Assessing the baseline condition of an area using a limited number of species or habitats may skew the true condition of biodiversity in a landscape. Once the condition of the ecological features has been described, any trends in changes to the ecological features should be identified. Pressures that may be causing poor ecological health and adverse trends should also be examined to inform future predictions of the likely evolution of the state of the ecological features without implementation of the spatial plan or development project. Existing measures in place to protect ecological health should also be identified

Appendix 4 – Thresholds and criteria for assessing the significance of cumulative effects

When determining the significance of the cumulative effect of a spatial plan or development project the value and sensitivity of the ecosystem should be considered, particularly where thresholds or standards may be exceeded. The magnitude and spatial extent of the effects (geographical area and size of the ecosystem likely to be affected) should also be considered. The probability, duration, frequency and reversibility of the causes of the effects may also influence the assessment.

In some cases, thresholds may be identified beyond which significant irreversible environmental effects may occur. For example, Peterkin (2002) identified three thresholds of potential significance to woodland and woodland species planning (these include, minimum areas of individual woods, threshold separations between woods, and minimum woodland density). However, in many cases information on thresholds is not available. Where valid thresholds have been identified through other research, these should be applied.

The following list of key points on assessing the significance of effects has been adapted from research for the Austrian Government. They were originally developed to help assess the environmental effects of projects, but set out principles of significance that are valid for all types of effect at both the plan and project level:

- significance has to be determined individually in each case. Effects which are significant in one situation are not necessarily significant in another;
- analysis of significance needs to be proportionate. It should be able to be carried out with reasonable time and effort. The effort expended to assess significance should be proportionate to the expected severity of the effect;
- flexibility is important so that individual cases can be assessed. Criteria should be considered as guidelines, not rules; and
- mathematical models are difficult to use to determine significance. Many aspects can be covered by verbal descriptions. The use of numeric models could give rise to fictitious precision. An attempt at quantifying qualitative and semi-quantitative aspects will not lead to an increase in objectivity.

Research Information Note

English Nature Research Reports, No. 673

A practical toolkit for assessing cumulative effects of spatial plans and development projects on biodiversity in England

Report Authors: Land Use Consultants, January 2006
Keywords: cumulative effects; toolkit; development; spatial plans

Introduction

'Going, going, gone? The cumulative impact of land development on biodiversity in England' (English Nature, 2005) highlighted the risk of significant cumulative effects of land development on biodiversity in England. However, it was not possible, based on the evidence available, to determine if the cumulative weight of planned or desired development in England is sustainable, or if it is likely to prevent recovery of biodiversity and ecosystem functioning and resilience to sustainable levels. To convince decision-makers that the cumulative effects of a spatial plan or development project on biodiversity are significant, or otherwise, it will be essential to prepare a robust case.

What was done

English Nature commissioned Land Use Consultants:

- to develop a basic toolkit to enable cumulative impacts to be identified, evaluated, and presented to decision-makers;
- to undertake a thorough explanation and evaluation of relevant tools and methodologies which are currently available, and which can be used in the process; and
- to undertake an evaluation of additional sources of evidence.

Results and conclusions

The study resulted in a practical toolkit for revealing and evaluating cumulative effects of development plans on biodiversity. The toolkit is structured into 5 sections, with the first two setting the context for the study and exploring general background to cumulative effects assessment. Two core sections are in effect stand-alone guides to cumulative effects assessment, the first intended for use with Regional Spatial Strategies and Local Development Frameworks, the second for use in assessing individual development projects. The final section provides pointers to further possible development of the toolkit and an overview of available cumulative assessment methodologies.

Continued……

Key messages from the study were:

- Consideration of cumulative effects should be an integral part of the environmental assessment conducted in preparing spatial plans and in designing, constructing and operating developments and should be taken into account from the very earliest stage in these processes.
- An ecosystem-based approach, ecosystem resilience, environmental capacity and environmental limits, should be adopted when considering cumulative effects of development.
- The precautionary principle should be applied where there is uncertainty about cumulative effects.
- The assessment of cumulative effects should consider both positive and adverse effects, and requires a long-term view. Global, national, regional and local concerns all need to be taken into account.

English Nature's viewpoint

This toolkit presents practical guidance on how to carry out an assessment of the likely cumulative effects on biodiversity of spatial plans and development projects as a part of an overall environmental assessment influencing the preparation of these plans and projects.

The toolkit is designed primarily to assist English Nature staff in responding to consultations from Regional Planning Bodies and Local Planning Authorities. However, Planning Authorities and developers may also find it useful in ensure that the likely cumulative effects of their spatial plans and development projects are considered from the very earliest stages of plan preparation and development design. It also gives Planning Authorities and developers' insight into English Nature's expectations with respect to identification, examination and reporting of likely cumulative effects of plans and projects.

Selected references

ANON 2005. *Sustainability Appraisal of Regional Spatial Strategies and Local Development Documents* Office of the Deputy Prime Minister

COUNTRYSIDE COUNCIL FOR WALES, ENGLISH NATURE, ENVIRONMENT AGENCY, ROYAL SOCIETY FOR THE PROTECTION OF BIRDS 2004. *Strategic Environmental Assessment and Biodiversity: Guidance for Practitioners*

ENGLISH NATURE 2005. Going, going, gone? The cumulative effects of land development on biodiversity in England *English Nature Research Reports*, No. 626

Further information

English Nature Research Reports and their *Research Information Notes* are available to download from our website: www.english-nature.org.uk

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