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What nature can do for you

A practical introduction to making the most of natural services, assets and resources in policy and decision making

Latest update: 18 October 2010



Published by the Department for Environment, Food and Rural Affairs.
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This document is available online at: <http://www.defra.gov.uk/environment/policy/natural-environ/documents/nature-do-for-you.pdf>

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Executive summary

This guide is designed to help policy makers across Government to understand:

- The value of what nature does for you now,
- The costs and risks we are leaving ourselves open to if we fail to take the value of its services into account in our decisions,
- How you can work with natural systems to help you deliver efficiently in the future.

What's it got to do with me?

Taking the value of the services we get from nature into account in your decisions isn't an 'optional extra', it is central to the Coalition Government's aim to be the 'Greenest Government ever' by putting the value of the natural environment at the heart of policy making because:

- **There is evidence we just can't afford to ignore:** The Economics of Ecosystems and Biodiversity¹ (TEEB) is a major international study that is revealing the enormous economic value of the services our ecosystems provide and the very real social and economic costs of their degradation and loss. TEEB estimates that, globally, the **degradation of our planet's ecosystems** is costing us **€50 billion each year**.
- **It will help you to avoid significant costs and risks to your policy objectives:** The services we get from nature underpin our economic prosperity and social wellbeing and play a fundamental part in a wide variety of Government policy objectives **such as public health, economic recovery, sustainable businesses, education, culture, climate change and sustainable transport**. Understanding and managing the impact your policies have on the ability of our natural systems to function will help you:
 - to **increase long-term resilience** of your policies,
 - to **reduce risks to your objectives** from failing natural systems
 - to **reduce public costs** from degraded natural services
- **It is part of good policy-making:** Assessing the general environmental impact of policy options has long been a part of the impact assessment process and it is now possible to make more sophisticated assessments of the, previously less visible, **costs** to society from damage to our natural assets and economic **benefits** from managing them well. (HM Treasury Green Book: http://www.hm-treasury.gov.uk/green_book_guidance_environment.htm)

¹ <http://www.teebweb.org/>

How can this guide help you to take the value of nature into account in your decision and policy making?

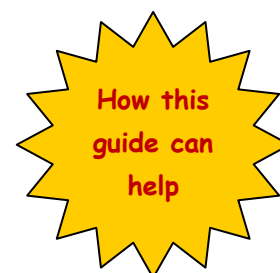
Considering and valuing our natural resources and services in decision making in this way is known as taking an 'ecosystems approach'. This guide is a practical introduction to using an ecosystems approach in policy making.

An ecosystems approach is not a separate process to be carried out in addition to regular policy development. It is a way of looking at the natural environment at all stages in the policy making process that helps you to take the value of the natural environment into account in your decisions. It does not duplicate or replace existing environmental policies or approaches, such as sustainable development and adapting to climate change, but taking an ecosystems approach can help you to consider the natural environment in delivering them.

Defra has been developing Government's understanding of an ecosystems approach for a few years; releasing an action plan for embedding an ecosystems approach: "[Securing a healthy natural environment](#)" in 2007 and an update to it: "[Delivering a healthy natural environment](#)" in 2010. Taking the value of nature into account in policy and decision making continues to be central to our work, as highlighted in the [Defra Structural Reform Plan](#)

The guide is focussed on helping policy makers to put this into practice and includes:

- A clear explanation of the **principles of an ecosystems approach**
- Details on **how an ecosystems approach can help policy makers** to take account of the value of the natural environment at every stage of the policy making process
- **1 hour of essential reading** to help readers quickly get up to speed on this issue
- A **'self-assessment'** to help policy makers to see how they are doing already and what could be gained by doing more to understand how the natural environment interacts with their policy issue
- **Sign-posting to a range of detailed resources, case-studies and further reading** on specific topics such as valuation and systematic thinking.



So what will I be doing differently if I use an ecosystems approach?

An ecosystems approach will be different for different policy areas, but two key aspects are:

- Looking for **opportunities to work with natural systems to deliver** your policy objectives
- Doing a **thorough impact assessment** that considers the positive and negative impacts of the policy options on the services we get from nature

Doing both of these well is likely to involve doing the following:

- Thinking long term
- Thinking large scale
- Thinking outside traditional policy boundaries
- Carrying out some sort of valuation of the ecosystem services involved
- Involving both the producers and beneficiaries of ecosystem services in your policy development.

Some simple ideas for getting started on this agenda

If you are a CEO or Permanent Secretary, have you considered the natural services your organisation's strategic priorities rely most upon, the value of these to your organisation, and your impacts on the assets providing these services? You could:

- add an agenda item to your management team or board meeting about natural services and natural capital.
- Ask your Chief Scientific Adviser or Chief Economist to provide you with some advice or a presentation on this agenda.
- Invite a presentation about this from a Defra colleague.

If you are a Management Board Member or Director General, what are the implications for your Group or command's key priorities? You could:

- schedule a discussion item on this at one of your management team meetings
- commission a short scoping project which will use the guide and highlight key implications for your policy areas.

If you are a Director or Senior Responsible Owner, have you considered the implications for your key programmes or activities? You could:

- ask your programme managers to read the guide and highlight the key implications and options for applying this to your work.
- Ask your analysts to consider implications for your evidence strategy and economic valuation work.

If you are a policy maker, have you considered the implications of the guide for your specific policy area? You could:

- Try listing the natural services your policy relies on using the list of ecosystem services at Annex D.
- Do the 1 hour of essential reading at section 5.1.1.
- Work through the self-assessment at section 4.3 to see how you're already doing and find out what else you could do to minimise costs and risks associated with natural services and maximise opportunities from them.
- Discuss this agenda with your analysts and delivery partners.

Introduction

1.1 What is this guide about?

The information and resources in this guide can help you to make better policies and decisions based on a deeper understanding of the services we get from the natural environment and how we can make the most of them in Government policies to create the greatest public benefit.

It's about looking beyond just 'protecting the environment' to working with natural systems in a positive way by taking the value of the services they provide into account in our policy making. If we can do that then we will get the most economic and social benefit from them and avoid the costly consequences of damaging them.

This way of considering the natural environment in decision making can be described as taking an '**ecosystems approach**' and is what this guide is designed to help you to use in your policy work.

1.2 Who is this guide for?

The resources in this guide are primarily aimed at people working in a **policy** environment, but the principles and rationale which are set out would be relevant to anyone with an interest in this issue.

1.3 How can you use this guide?

The guide can be used in a variety of ways, depending on your starting place:

Entry-level

If you are new to the concept of natural value and ecosystem services then you'll find it useful to start at the beginning and read Chapters 2 and 3 before doing the '1 hour of essential reading' at section 5.1.1 and the self-assessment at section 4.3.

Intermediate

If you're more familiar with the concepts of natural value and ecosystem services then you might want to start with the self-assessment at section 4.3

Advanced

If you are already experienced in using an ecosystems approach, but want some more information on a specific aspect then the resources in Chapter 5 may be useful.

Where the guide refers to other documents and resources, we have included web-links to them – please let us know if any of them are broken: ecosystems@defra.gsi.gov.uk

2. Context

2.1 What's at stake?

Our natural environment underpins our economic prosperity, our health and our wellbeing. The more we understand about the natural world, the more we realise:

That **it supports us** in ways which may not always be visible but which have a very real value:

- The **value of natural resources** extracted for use in the UK economy in 2007 was **£41 bn**.
- Our peatlands are a haven for wildlife, but are also a vital **store for carbon**. They store **5 billion tonnes of carbon** which we would have to account for elsewhere if it was released through degradation.

That **damaging it** can have costly consequences:

- Globally, it is estimated that the **degradation of our planet's ecosystems** is costing us **€50 billion** each year – which could rise to the equivalent of 7 per cent of global GDP by 2050.
- **air pollution reduces life expectancy** over the UK population by an average of 6 months at a social cost of **£15 billion per annum**.

That **working innovatively with nature** can create opportunities to reduce costs and have multiple benefits for society.

- A project in south west England is bringing together a water company, NGOs and land owners to find **land management based solutions for improving water quality** that are estimated to be resulting in a cost-benefit ratio of 1:65.
- People who live within 500m of accessible **green space** are 24 per cent more likely to meet recommended levels of physical activity. Reducing the sedentary population by just 1 per cent could **reduce UK morbidity and mortality** rates valued at **£1.44 billion**.

High profile research projects such as [The Economics of Ecosystems and Biodiversity \(TEEB, www.teebweb.org\)](http://www.teebweb.org) and the [UK National Ecosystem Assessment \(NEA, uknea.unep-wcmc.org\)](http://uknea.unep-wcmc.org) are producing more evidence of this kind which is increasingly capturing the attention of the world's media, politicians and the public. Recent publications that illustrate this issue well include:

- [“No Charge? – Valuing the natural environment”, Natural England,](#)
- [“Recovery, growth and the environment”, Defra](#)
- [“Naturally at your service – Why it pays to invest in nature”, RSPB](#)

2.2 Why is valuing the natural environment a Whitehall-wide issue?

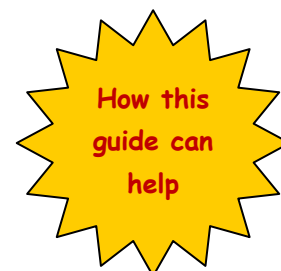
Traditionally, we have relied on ‘environmental policies’ to provide protection for our natural assets from direct damage. However, many of our most significant environmental challenges do not stem from a single cause, but result from a range of incremental impacts on the wider system which regulatory mechanisms are less well-suited to address. These incremental impacts are degrading our natural assets and reducing their ability to deliver the services that a wide range of Government policy aims rely on such as **public health, economic growth, sustainable businesses, education, culture, climate change and sustainable transport**. We have also traditionally seen the natural environment as something we just need to protect rather than looking for new ways it can help us to deliver Government aims.

In developing Government policies across Whitehall it is important that we understand how the natural environment can help deliver our objectives and the true cost of the pressures we put on it so that:

- **We can present a full picture of the public costs and benefits of policy options to Ministers and the public.** Taking the value of our natural services into account isn’t an ‘optional extra’, it’s part of good policy making. Assessing the environmental impact of policy options has long been a part of the impact assessment process and has been a valuable way of assessing the direct impact of policies on individual aspects of the environment. It is now possible to make more sophisticated assessments of the positive and negative impacts of policy options on our natural assets and the way they interact as a system to provide essential services to our economy and society.
- **We can make the most of the way the natural environment can support us to face today’s and future challenges.** Conducting a better impact assessment will help to highlight where policy options can deliver the most public benefit from the natural environment. An ecosystems approach can also help you to look to the natural environment for innovative solutions to policy problems.

The resources in this guide can help you to **use an ecosystems approach** to:

- provide your Ministers and the public with a clearer picture (impact assessment) of the, previously less visible, **costs** to society from damage to our natural assets and economic **benefits** from managing them well.
- explore how the natural environment can **help to deliver your policy objectives** in new ways that could reduce inefficiencies and create multiple public benefits at a time when we are all having to do more with less.



2.3 How does an ecosystems approach fit with other environmental assessments and wider environmental policies?

An ecosystems approach does not duplicate or replace any of the existing environmental policies, assessments or appraisal processes, but it can help you to do them better:

Sustainable Development

Sustainable development is the overarching framework for ensuring that policy makers take into account and balance the social, economic and environmental impacts of policies and decisions they make. An ecosystems approach can be thought of as a way of considering the natural environment as part of wider sustainable development considerations. Crucially, it can help policy makers to consider less visible impacts on the natural environment and provide the data needed to compare societal costs to, and benefits from, the natural environment with other costs and benefits.

<http://www.defra.gov.uk/sustainable/government/index.htm>

Adapting to Climate Change

Climate change underlines the need for a long-term, ecosystem-based approach. Habitats and species will be affected directly by climate change and sea level rise, but the protection of the natural environment and the ecosystem services that it provides is essential to support economic activity and to allow us to adapt to climate change. It is vital that any adaptation action is 'sustainable'; this means that any responses by society should not actually add to climate change, cause detrimental impacts or limit the ability of other parts of the natural environment, society or business to carry out adaptation elsewhere. An ecosystems approach can help you to think through how natural processes might be affected by changes to the climate and how your policies need to take account of and manage these risks.

<http://www.defra.gov.uk/environment/climate/documents/climate-change-plan-2010.pdf>
and <http://www.ukcip.org.uk/>

Policy impact assessment

Environmental appraisal is a key element of the impact assessment process. An ecosystems approach can help you to identify a wider range of policy options and get values for the services that the natural environment provides to use in your cost : benefit analysis. Crucially, if used from the beginning of the policy process, an ecosystems approach can help you to collect the data and evidence you need for an effective consideration of the environment in your impact assessment. Specifically, an ecosystems approach can help to inform the "Wider Environmental Impacts" and "Sustainable Development" tests carried out as part of your impact assessment.

<http://www.defra.gov.uk/corporate/policy/guidance/index.htm>

Strategic Environmental Assessment

Strategic Environmental Assessments are a systematic assessment of any plan or programme likely to have a significant effect on the environment. If you have taken an ecosystems approach in your work and then have to undertake an SEA then you will have done a lot of the ground work needed and will be in a good position to tackle it.

<http://www.communities.gov.uk/publications/planningandbuilding/practicalguidesea>

3. Using an ecosystems approach in policy making

3.1 Introduction to ecosystem services

Q. What is an ecosystem?

A widely used definition of an ecosystem is that adopted by the Convention on Biological Diversity² (CBD) and the Millennium Ecosystem Assessment³ (MA):

"A dynamic complex of plant, animal and micro-organism communities and their non-living environment interacting as a functional unit".

Q. What are ecosystem services?

Ecosystem services can be defined as services provided by the natural environment that benefit people. These benefits include:

- **Resources for basic survival**, such as clean air and water;
- A **contribution to good physical and mental health**, for example through access to green spaces, both urban and rural, and genetic resources for medicines;
- **Protection from hazards**, through the regulation of our climate and water cycle;
- **Support for a strong and healthy economy**, through raw materials for industry and agriculture, or through tourism and recreation; and
- **Social, cultural and educational benefits**, and wellbeing and inspiration from interaction with nature.

While there is no single, system for categorising all ecosystem services, the Millennium Ecosystem Assessment (MA) framework is widely accepted and is a useful starting point. The MA identifies **four broad categories of ecosystem service** which all lead to different benefits:

- **Provisioning services:** we obtain products from ecosystems such as food, fibre and medicines.
- **Regulating services:** we benefit from the results of ecosystem processes such as water purification, air quality maintenance and climate regulation.
- **Cultural services:** we gain non-material benefits from our interaction with the natural environment such as education and wellbeing.
- **Supporting services:** functions that are necessary for the production of other ecosystem services from which we benefit, such as soil formation and nutrient cycling.

² <http://www.cbd.int/decision/cop/?id=7148>

³ <http://www.maweb.org/en/index.aspx>

The UK National Ecosystem Assessment have defined a list of ecosystem services that are relevant to the UK (see Annex D). The relevance of each of the services will vary depending on your policy area: which of the ecosystem services do you most rely on?

3.2 What is an ecosystems approach?

An ecosystems approach can mean different things to different people. However, in this guide it is defined as:

"A generic framework for incorporating the holistic consideration of ecosystem services and their value into policy, plan and decision making"

The concept of an ecosystems approach originated with the Convention on Biological Diversity which identified 12 principles for its application, but emphasised that such an approach is not a formula to be applied but a framework that can be adapted to suit all issues and situations. Based on this foundation, Defra has developed six principles for its application in England:

- taking a more **holistic** approach to policy-making and delivery, with the focus on maintaining healthy ecosystems and ecosystem services.
- ensuring that the **value** of ecosystem services is fully reflected in decision-making.
- ensuring **environmental limits** are respected in the context of sustainable development, taking into account ecosystem functioning.
- taking decisions at the appropriate **spatial scale** while recognising the **cumulative impacts** of decisions.
- applying **adaptive management** of the natural environment to respond to changing pressures, including climate change.
- identifying and involving all **relevant stakeholders** in the decision and plan making process.

For more background on the concept of an ecosystems approach see the documents listed in '**1 hour of essential reading**' in section 5.1.1

The rest of this guide is designed to help you apply an ecosystems approach to your policy work, but in essence it is about:

- Looking for **opportunities to work with natural systems to deliver** your policy objectives
- Doing a **thorough impact assessment** that considers the positive and negative impacts of the policy options on the services we get from nature.

Doing both of these well is likely to involve:

- Thinking long term.
- Thinking large scale.
- Thinking outside traditional policy boundaries.
- Carrying out some sort of valuation of the ecosystem services involved.
- Involving both the producers and beneficiaries of ecosystem services in your policy development.

3.3 How can an ecosystems approach help you to make better policies?

Using an ecosystems approach can help you undertake all aspects of good policy and decision making:

- making a thorough **analysis of the issue** you are trying to address.
- identifying a range of **options** for tackling it and discussing them with others
- assessing the **costs and benefits** of each option, including the baseline / 'do nothing' option.
- making a **decision** that will achieve your outcome with least public cost and most public benefit over the lifetime of the policy.
- Working with **delivery partners to implement** the policy.
- **Evaluating and adapting** your policy in a way which takes into account the services that the natural environment provides and their value to society.

In terms of outcomes, an ecosystems approach can help you to

- **increase long-term resilience** of your policies
- **reduce risks to your objectives** from failing natural systems
- **reduce public costs** from degraded natural services

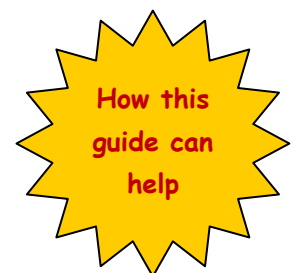
The table below shows what an ecosystems approach can help you to do at **each stage of the policy making process** to make the most of what the natural environment can do for your policy aims.

Policy stage	An ecosystems approach can help you to:
Defining the issue and understanding the situation	<ul style="list-style-type: none"> • Understand what the role of the natural environment is in the current situation. • Identify a fuller range of people to involve in the policy development. • Identify the scale, type and depth of evidence you need to gather about the natural environment in order to be able to make an adequate assessment of positive and negative impacts on it.
Developing a range of options for tackling the issue	<ul style="list-style-type: none"> • Identify ways in which the natural environment can help you deliver your objectives. • Identify risks from the natural environment to your policy objectives. • Identify the pressures on the natural environment's ability to function as a system and how these might change over time under each option. • Identify aspects of the natural environment you must protect / safeguard by law or other constraints.

Identifying the costs and benefits of each option	<ul style="list-style-type: none"> • Build your baseline of what the natural environment is currently providing in terms of services and their economic value so any changes can be measured (monetised and non-monetised). • Assess the impact of each option on the services that the natural environment provides and the value of those services to society. • Review options in the light of information about impacts on natural systems and the value of the services they provide. • Choose an option that makes the most of the services that the natural environment can offer whilst protecting its ability to function as a system now and in the future. • Make better and more sustainable decisions that could save money in the long term.
Preparing for delivery	<ul style="list-style-type: none"> • Identify and involve a fuller range of people who need to be involved in delivery. • Understand the implications of any negative impacts on the natural environment and identify ways to avoid them.
Evaluate and adapt	<ul style="list-style-type: none"> • Consider a fuller range of impacts on and benefits to the natural environment from your policy after it has been implemented.

3.4 So what would you actually be doing differently?

The short answer is that it will be different for everyone. Sections 4 and 5 of this guide can help you to assess what an ecosystems approach might look like for your policy and sign-post you to resources to help you to do it.



Essentially you will be thinking broadly about the natural environment, getting better information about the interactions with your policy area and involving a wider range of people in your policy making process.

There are a wide range of techniques and resources to help you do these activities in Chapter 5 of this guide. Some are most useful at specific points in the policy cycle, but three types of activity are helpful to think about throughout the policy cycle:

- **Thinking broadly about the whole natural system** – a useful way of doing this is to make a list of the ecosystem services you rely on and impact on and then keep referring back to it at every stage of the policy making process. The tools and techniques in the first few rows of the resources table in section 5.2 can help too.
- **Valuation** – You will need to decide at the start of the policy process what sort of valuation of ecosystem services might be appropriate, when and for what purpose: engaging stakeholders in discussion, identifying policy options, choosing between

policy options, designing delivery and evaluating the policy or some or all of these. Valuation is something that you should have an early discussion with your economists on, but a useful introduction is the first two chapters of Defra's '[An introductory guide to valuing ecosystem services](#)': [<http://www.defra.gov.uk/environment/policy/natural-environ/documents/eco-valuing.pdf>]. Sections 4.5 and 5.3 of this guide also give an overview how valuation can be used in an ecosystems approach and point you to resources that can help you to do it.

- **Involving people** – both thinking systematically and valuation will include identifying and involving a wider range of people than you might otherwise have done. The key aspect is to identify who is impacted on by what ecosystem services and ensuring that you engage them in the policy process. Defra has commissioned some guidelines for using participatory and deliberative techniques as part of an ecosystems approach. The guidelines will be available in late 2010 and will provide more information about the rationale for wider involvement and details about appropriate methods.

3.5 How do you know when you've done it? – what does success look like?

There is no one right outcome or answer. Embedding an ecosystems approach will look different for different situations, but a policy or decision making process that is incorporating an ecosystems approach is likely to be where:

- **The natural environment is viewed as a system** that can contribute to the delivery of outcomes and where decisions may have impacts on a number of parts of it.
- The **value of the natural environment** (monetised and non-monetised) is incorporated into decision making.
- Options are developed and decisions made at a **geographic scale** that is appropriate to the nature of the potential environmental impacts involved.
- **Responsiveness to change** is built into the policy or plans. Solutions will still work if the situation changes
- **Legal** (e.g. SSSIs), and where possible, **biophysical limits** (e.g. water availability) are incorporated into decisions and plans.
- The **full range of interested parties** likely to be affected by the policy or decision and its impact on the services that the natural environment provides are involved.

If your policy or decision making process is displaying these characteristics and there is evidence that they are shaping outcomes then you are already embedding the principles of an ecosystems approach.

Defra is developing some policy case-studies to illustrate how an ecosystems approach can be applied, but if you would like to contact someone in Defra to discuss your policy situation then just email the Natural Environment Strategic Unit: ecosystems@defra.gsi.gov.uk

3.6 How do you know if you need to use an ecosystems approach?

Potentially all policy areas could take an ecosystems approach, but how critical it is will vary because some Government policy areas are more reliant on natural services than others and some will have a bigger impact on the natural environment than others.

An ecosystems approach is not a separate process, it is essentially about doing a good impact assessment and, where possible, looking for opportunities to work with, rather than against, natural systems. Therefore, at a strategic level similar to sustainable development and adapting to climate change, all policy makers need to think about it, but for specific policies and decisions the relevance will vary.

Government-wide impact assessment guidance includes advice on carrying out a [‘wider environmental impacts’ assessment](#) which can help you to determine whether a more detailed look at the way the natural environment works as a system would be beneficial for your policy area.

As a quick indicator you could ask yourself:

- Where might my policy rely on nature?
- Where might my policy affect the natural services that others rely on?

4. How to do it - practical application of an ecosystems approach in your policy situation

4.1 Overview

An ecosystems approach is a way of thinking about the natural environment during your policy development rather than a separate process. It will be different for different policy areas, but two key aspects are:

- Looking for **opportunities to work with natural systems to deliver** your policy objectives
- Doing a **thorough impact assessment** that considers the positive and negative impacts of the policy options on the services we get from nature

There is therefore no single 'how to' guide, but effectively embedding an ecosystems approach in your policy is likely to involve:

- **Identifying the ecosystem services** that are at play over the **geographic and time scale** of your policy and quantifying how your policy options will change them.
- **Valuing the changes in ecosystem services** so that they can be fully considered in cost / benefit analyses (impact assessments).
- Looking for **opportunities to utilise natural systems** to deliver your policy aims.
- **Identifying legal and biophysical constraints** on your policy options and how these might change in the future.
- **Identifying risks from the natural environment** to your policy outcomes and how these might change in the future.
- **Involving all interested parties** that are likely to be affected by changes to ecosystem services brought about by the policy.

4.2 How to make practical use of the resources in this guide

Chapters 4 and 5 of this guide are designed to help you to work out how you can start to, or improve how you, incorporate an ecosystems approach into your policy work:

- The '**Policy-maker's self-assessment on an ecosystem approach**' at section 4.3 and Annex A will help you to recognise where you are already doing well, how you could improve or how to get started.
- You can then use the '**Resources for using an ecosystems approach**' in Chapter 5 to tackle the issues that you've identified in the self-assessment.

If you are new to using an ecosystems approach then you might find it useful to do the '**1 hour of essential reading**' at section 5.1.1 before you do the self-assessment or explore the more specific resources.

4.3 How are you doing already? - a policy maker's self-assessment on an ecosystem approach

It is likely that you are already applying some of the principles of an ecosystem approach in your work.

The 'Policy-maker's self-assessment on an ecosystem approach' at Annex A is a questionnaire that you can use to think about the different aspects of an ecosystems approach in relation to your policy work.

Tips for using the self assessment:

- **Don't spend too long answering it** – it's designed to be a quick self-assessment that will enable you to decide what it is you might want to do next to **start** or **continue** embedding an ecosystems approach into your policy work. If you can't answer a question then just mark it and move onto the next one.
- **Getting a few people in the policy area to complete it** and then coming together to discuss your conclusions can help flush out different perspectives and help you to focus on what really matters going forward.
- **Use the template** at the end of Annex A to **record your thoughts and any actions as you go through**, including if you can't answer a question at all.

4.4 The results - how did you do in the self-assessment and what should you do next?

Once you have completed the self-assessment, have a look at the 'next steps' table at Annex B to see how you might best proceed. It is likely that you will have a range of strengths and areas for improvement. The resources in section 5.2 are broadly organised around the activities and processes you might be trying to undertake to embed an ecosystems approach.

Whatever your next step, it is a good idea to discuss your results with:

- **Your economist and / or a Defra economist** (ecosystems@defra.gsi.gov.uk) who will be able to talk to you about what sort of valuation work you might want to undertake.
- **Your SRO / Director** to explore the way that an ecosystems approach could improve your policy solutions, reduce risks to your policy outcomes and reduce costs of delivery.
- **Your delivery partners** who can play a key role in ensuring that your policy makes the most of the natural environment on the ground.

4.5 A few words about valuation

What do we mean by valuation in an ecosystems approach?

Valuation at its simplest is putting a value on something, usually to assess whether one action is preferable to another. In an ecosystems approach, it is used to put a value on the changes in ecosystem services that could result from policy proposals.

Valuing ecosystem services is a fundamental aspect of an ecosystems approach because it enables the value of ecosystems services to be taken into account in impact assessments alongside other costs and benefits.

The diagram below shows that the actual valuation of changes in ecosystem services can happen only once a range of other data and analysis has taken place. It is therefore essential to think about valuation throughout the policy process and not just at the 'option appraisal' stage.



How to do it

Involving your economist at an early stage will help you to determine what you need to do to use valuation effectively in your policy process.

There is a range of monetary and non-monetary methods of valuing ecosystem services that can be used. The most appropriate type of valuation for your policy will depend on the purpose you are using valuation for and the availability of time and data to you.

Section 5.3 of this guide highlights some of the methods and issues involved in ecosystem service valuation in different situations.

Defra has produced an '**Introductory guide to valuing ecosystem services**'

<http://www.defra.gov.uk/environment/policy/natural-environ/documents/eco-valuing.pdf>

that includes both an introduction for generalists and more specific guidance for specialists / economists.

5. Resources for using an ecosystems approach

This section of the guide is designed to sign-post you to the tools and resources that will help you to use an ecosystems approach in your work and is split into three sections:

- Resources part 1: Things that will give you an overview of an ecosystems approach
- Resources part 2: Want more detail? – three key places to go to for further reading
- Resources part 3: Ecosystem services valuation

5.1 Resources part 1: Things that will give you an overview of an ecosystems approach

5.1.1 One hour of essential reading to get you started

If you are new to using an ecosystems approach then reading the following short documents will give you a good foundation from which to start exploring some of the more detailed and specific guidance and resources.

- **First chapter of Defra’s Ecosystems Approach Action Plan Update ‘Delivering a healthy natural environment’:** Section 2 (pp 6-11) outlines how the ecosystems approach can be applied in the UK.
<http://www.defra.gov.uk/environment/policy/natural-environ/documents/healthy-nat-environ.PDF>
- **Parliament’s ‘postnote’ on ecosystem services:** a ‘layman’s terms’ introduction to the concept of ecosystem services.
<http://www.parliament.uk/documents/post/postpn281.pdf>
- **Defra’s natural environment narrative:** will give you the big picture on why the natural environment is important and what it does for our economic and social wellbeing. <http://www.defra.gov.uk/environment/policy/natural-environ/documents/narrative.pdf>
- **First two chapters of ‘An introductory guide to valuing ecosystem services’:** The first two chapters (pp 3 – 20) provide an overview of what valuation is, why it is useful and how environmental appraisal sits in the overall policy framework.
<http://www.defra.gov.uk/environment/policy/natural-environ/documents/eco-valuing.pdf>

If you have any problems with the web-links for any of these documents then just search for them online by title or email ecosystems@defra.gsi.gov.uk to request a copy

5.1.2 Want more detail? – three key places to go to for further reading

If you want to know more of the theoretical and policy context for an ecosystems approach and find out about the latest major pieces of research then the following are good places to go:

- **The Millennium Ecosystem Assessment:** The Millennium Ecosystem Assessment (MA) is a landmark piece of research, initiated by the UN in 2001, on how ecosystems support us and why we should use an ecosystem approach. The ecosystem services classification it defined is now widely accepted as a useful way of identifying the wellbeing benefits we get from the natural environment and most later research and guidance is based on it.
<http://www.maweb.org/en/BoardStatement.aspx>
- **The UK National Ecosystem Assessment:** An independent study of the nation's ecosystems which will complete in February 2011, but is already producing useful data about UK ecosystem services and their value: <http://uknea.unep-wcmc.org>
- **The Economics of Ecosystems and Biodiversity (TEEB):** Pavan Sukhdev's ongoing study on the value of the natural environment builds on the MA work, and has been described as "doing a 'Stern' for biodiversity". In its interim report, published in 2008, it laid out the case for investment in biodiversity preservation and ecosystem maintenance as a cost effective way to provide a range of benefits to society and the global economy over the coming years. It also pointed out the cost of policy inaction, both currently and in future. The study has produced a range of reports including 'TEEB for policy makers':
<http://www.teebweb.org/ForPolicymakers/tabid/1019/Default.aspx>

5.2 Resources part 2 - Things to help you to use an ecosystems approach

There is a lot of resources and research available on applying an ecosystems approach. The resources listed below are only a small selection, but include those that have particular relevance policy makers undertaking a range of activities as part of the policy making process.

Resources to help you to.....	
<p>Understand what the role of the natural environment is in the current situation – both at a high level and a more specific benefits level</p>	<ul style="list-style-type: none"> • Natural environment narrative: five page document setting out high level value of the natural environment: http://www.defra.gov.uk/environment/policy/natural-environ/documents/narrative.pdf • Economic Growth and the Environment: report showing how the environment supports our economy http://www.defra.gov.uk/evidence/series/documents/paper2-economic-growth.pdf • The Millennium Ecosystem Assessment, ‘Summary of the board’: High level global view of the value of the natural environment: http://www.maweb.org/en/BoardStatement.aspx • The Economics of Ecosystems and Biodiversity (TEEB) for policy makers: a good introduction to how the natural environment can be taken into account in policy making http://www.teebweb.org/ForPolicymakers/tabid/1019/language/en-US/Default.aspx • The UK National Ecosystem Assessment ‘progress and steps towards delivery’ interim report includes an overview of how the natural environment supports us in the UK and a description and an illustrative diagram of how to identify ecosystem services: http://uknea.unep-wcmc.org/LinkClick.aspx?fileticket=cSqQ0kOfGJA%3d&tabid=105 • The Defra report ‘An introductory guide to valuing ecosystem services’ covers ecosystem service identification in chapters 1 to 3. http://www.defra.gov.uk/environment/policy/natural-environ/documents/eco-valuing.pdf
<p>Understand how the natural environment is functioning as a system</p>	<ul style="list-style-type: none"> • The UK NEA is producing outputs that will help you to understand how the natural systems are supporting us: http://uknea.unep-wcmc.org/Default.aspx • The Government Foresight Programme Land Use Futures project can help you with systematic mapping: http://www.bis.gov.uk/foresight/our-work/projects/current-projects/land-use-futures

<p>Identify a fuller range of people to involve in the policy development and delivery</p>	<ul style="list-style-type: none"> • A Defra research report which will help you to identify and work with a wide range of stakeholders using participatory and deliberative techniques will be available in late 2010. This research project will also produce supplementary guidelines on using participatory and deliberative techniques in ecosystem services valuation. • The Natural Capital Initiative have published a report and range of presentations on “valuing our life support systems” which include consideration of how ecosystem services support urban communities: http://www.naturalcapitalinitiative.org.uk/9-valuing_our_life_support_systems/ • A number of initiatives to discuss the relationship between ecosystem services and people have published summaries of their seminars: <ul style="list-style-type: none"> ○ Integrating Sciences to Sustain Urban Ecosystem Services (ISSUES): http://issues.abertay.ac.uk/seminars.htm ○ Framing Ecosystem Services and Human Well-being (FRESH): http://www.nottingham.ac.uk/fresh/ • Defra’s work on designating Marine Conservation Zones, such as ‘finding sanctuary’: http://www.finding-sanctuary.org/ • EU Water project where a water company is working with landowners to increase water quality and reduce treatment costs: http://tamarconsulting.org/wrt/projects/water.htm • Natural England ecosystems pilots: Natural England’s pilot projects to apply an ecosystem approach
<p>Identify the scale, type and depth of evidence you need to gather about the natural environment</p>	<ul style="list-style-type: none"> • Guidance on how to define your policy in relation to ecosystems at a landscape scale is included in a Defra research project: “England’s terrestrial ecosystem services and the rationale for an ecosystem approach”: http://randd.defra.gov.uk/Default.aspx?Menu=Menu&Module=More&Location=None&Completed=0&ProjectID=14751#Description • A case-study that illustrates difference between just thinking about the immediate area around a development and a wider area.: “The selection of the M6-Heysham link road route”: http://randd.defra.gov.uk/Default.aspx?Menu=Menu&Module=More&Location=None&Completed=0&ProjectID=14755#Description
<p>Identify ways in which the natural environment can help you deliver your objectives</p>	<p>There are a growing number of case-studies exploring what the natural environment can provide for different policy situations:</p> <ul style="list-style-type: none"> • Public health: http://www.fph.org.uk/uploads/r_great_outdoors.pdf • Water quality: http://www.unitedutilities.com/scamp.aspx • Flood defence - Environment Agency’s case-studies: http://publications.environment-agency.gov.uk/pdf/SCHO0409BPVM-e-e.pdf

<p>Identify risks from the natural environment to your policy objectives</p>	<p>Useful resources for looking at risks from the natural environment include:</p> <ul style="list-style-type: none"> • Flooding foresight project: http://www.foresight.gov.uk/OurWork/CompletedProjects/Flood/index.asp And an update to the flooding foresight project as part of the Pitt Review following the 2007 floods: http://archive.cabinetoffice.gov.uk/pittreview/thepittreview/final_report.html • Climate Change Adaptation – Government guidance and resources: http://www.ukcip.org.uk/ and website for the UK Climate Projections 2009 http://ukclimateprojections.defra.gov.uk/ • Defra Soil Strategy: http://www.defra.gov.uk/environment/quality/land/soil/documents/soil-strategy.pdf
<p>Identify the pressures on the natural environment’s ability to function as a system and how these might change over time under each option</p>	<p>There is general horizon scanning guidance and research and information on pressures on the natural environment:</p> <ul style="list-style-type: none"> • Defra’s guidance and resources on environmental horizon-scanning: http://horizonscanning.defra.gov.uk/default.aspx?menu=menu&module=Home • Government guidance and resources on horizon scanning: http://www.foresight.gov.uk/Horizon%20Scanning%20Centre/index.asp <p>Research and guidance about pressures on the natural environment include:</p> <ul style="list-style-type: none"> • ‘Future trends and pressures’ Defra research report SD0314,;: http://randd.defra.gov.uk/Default.aspx?Menu=Menu&Module=More&Location=None&Completed=0&ProjectID=13762#Description • The Foresight Landuse Futures Report. http://www.foresight.gov.uk/OurWork/ActiveProjects/LandUse/LandUse.asp • A paper on risks to biodiversity: “Future novel threats and opportunities facing UK biodiversity identified by horizon scanning” http://onlinelibrary.wiley.com/doi/10.1111/j.1365-2664.2008.01474.x/pdf
<p>Identify aspects of the natural environment you must protect / safeguard by law or other constraints</p>	<p>There is a wide range of data sources and guidance on this subject, but the following provide a good starting place. Defining biophysical limits is particularly complex and you will need to decide whether there are critical issues that you need to look into in detail.</p> <p>Overview:</p> <ul style="list-style-type: none"> • A collection of research reports that consider of a wide range of data sources on different aspects of the natural environment is available on the Defra website: http://www.defra.gov.uk/environment/policy/natural-environ/research/programme.htm <p>Statutory designations and protected species</p> <ul style="list-style-type: none"> • Strategic Environmental Assessment guidance: Both the Department for Communities and Local Government and the Environment Agency provide good overviews of statutory requirements: http://www.communities.gov.uk/publications/planningandbuilding/practicalguidesea & http://www.environment-

	<p>agency.gov.uk/research/policy/32901.aspx</p> <ul style="list-style-type: none"> • Talk to Government’s statutory advisers on biodiversity (Natural England) and environmental quality (Environment Agency) <p>Biophysical limits</p> <ul style="list-style-type: none"> • NR0102, Defining and identifying environmental limits http://randd.defra.gov.uk/Default.aspx?Menu=Menu&Module=More&Location=None&Completed=0&ProjectID=13901#Description
<p>Incorporate the value of ecosystem services into your cost-benefit analysis.</p>	<p>An overview of valuation tools and techniques is shown in section 5.3 and Annex C of this guide.</p>
<p>Choose a policy option that makes the most of the services that the natural environment can offer whilst protecting its ability to function as a system now and in the future.</p>	<p>Delivering multiple public benefits:</p> <ul style="list-style-type: none"> • Network analysis can be a useful technique for relating environmental change to social and economic objectives. A good example of using network analysis in this way is the Thames Gateway project: NR0109, Guiding development in the Kent Thameside development area http://randd.defra.gov.uk/Default.aspx?Menu=Menu&Module=More&Location=None&Completed=0&ProjectID=14753#Description • UK NEA conceptual framework: http://uknea.unep-wcmc.org/About/ConceptualFramework/tabid/61/Default.aspx • A Defra funded case-study in Oxfordshire shows how they quantified benefits: NR0112 - Management of the Otmoor protected area (Oxfordshire) • The Environment Agency has written up a number of case-studies on where they are using an ecosystems approach to tackle flooding as well as providing other public benefits: Ecosystem services case studies <p>Adaptive management and future-proofing:</p> <ul style="list-style-type: none"> • Principles of adaptive management can be found in both the Government’s adapting to climate change resources: http://www.ukcip.org.uk/ and Defra’s biodiversity and climate change guidance: Climate Change Adaptation Principles – Conserving biodiversity in a changing climate • Future proofing resources. The Cabinet Office Strategy Survival Guide includes a number of tools and resources to help with future proofing: http://interactive.cabinetoffice.gov.uk/strategy/survivalguide/skills/index.htm

<p>Understand the implications of any negative impacts on the natural environment and identify ways to manage trade-offs.</p>	<p>If you are already working with your economist on valuation then this will be a key aspect of that work for the impact assessment.</p> <p>Examples of where tradeoffs have been analysed and managed include:</p> <ul style="list-style-type: none"> • A pilot system review on conflict resolution: “Scoping studies for systematic review” http://randd.defra.gov.uk/Default.aspx?Menu=Menu&Module=More&Location=None&ProjectID=16575&FromSearch=Y&Publisher=1&SearchText=NR0133&SortString=ProjectCode&SortOrder=Asc&Paging=10#Description • A Defra research report on participatory and deliberative techniques will be available in late 2010 and can help you to involve and engage people in managing impacts and trade-offs • The Environment Agency has written up a number of case-studies on where they are using an ecosystems approach to tackle flooding: Ecosystem services case studies • A Defra case study “Management of the Parrett Catchment Somerset”: http://randd.defra.gov.uk/Default.aspx?Menu=Menu&Module=More&Location=None&Completed=0&ProjectID=14756#Description
<p>Monitor and evaluate your policy in terms of its impacts on and benefits to the natural environment.</p>	<p>This is a new area of work so there is little guidance available, but a Defra research project covers how to use indicators for an ecosystems approach:</p> <ul style="list-style-type: none"> • NR0119 - Reviewing targets and indicators for an ecosystems approach : http://randd.defra.gov.uk/Default.aspx?Menu=Menu&Module=More&Location=None&Completed=0&ProjectID=15699#Description

5.3 Resources part 3 – Ecosystem services valuation.

5.3.1 Overview of tools and techniques for valuing ecosystem services

Valuation is all about making robust comparisons. Valuation is present anywhere that you use information to assess whether one action is preferable to another. There are a very large number of tools you can use to make this comparison easier, some of which require little time or information, and others which are very intensive but provide a result you can really trust.

The Treasury's Green Book recommends using cost-benefit analysis to help make comparisons, but sometimes you will have insufficient information to do this so it is useful to know about other tools that can provide similar insights. The **table at Annex C summarises the most useful valuation techniques for policy-making**, and guides you towards those most applicable given your time constraints, available information and purpose. It will be useful to discuss these techniques in more details with your local economists and social researchers.

Defra has produced an '**Introductory guide to valuing ecosystem services**' <http://www.defra.gov.uk/environment/policy/natural-environ/documents/eco-valuing.pdf> that includes both an introduction for generalists and more specific guidance for specialists / economists.

5.3.2 Monetary Valuation: Comparing between options, and between objectives

Valuation expressed in terms of money is extremely powerful because it allows you to compare options for achieving an objective in terms of which option is best and how much better it is. But it can also tell you whether pursuing one policy objective is more cost-beneficial than a completely different objective, allowing budget-holders to be strategic about spending across a whole portfolio of competing priorities. We therefore encourage policy-makers to attempt to place monetary values on the changes in ecosystem services caused by their policies, and we point to a range of techniques for doing this:

- Market valuation (for instance, direct measures of economic value like “defensive expenditure” or proxy measures like “replacement costs” methods)
- Revealed preference (for instance, hedonic pricing or the travel costs techniques)
- Stated preference surveys (using tools like contingent valuation or choice modelling)
- Value transfer (where the results of previous, similar, valuation studies are mapped onto you specific circumstances)

Each of these techniques is discussed in more detail in the “introductory guide to valuation”, which you should discuss with your local economist. Page 37 of the introductory guide includes a useful summary table:

<http://www.defra.gov.uk/environment/policy/natural-environ/documents/eco-valuing.pdf>

5.3.3. Dealing with uncertainty: Be proportionate and honest about the limits of your analysis

You are unlikely to know everything you need in order to do a flawless monetary valuation. The various techniques in Annex C give you an idea of different tools to deal with limited knowledge, but it is important to recognise the consequences of uncertainty. Here are a few guiding principles to remind you that the best decisions are taken when you know the limits of your analysis:

- Use meta-analyses where you can, so you draw on more than one source of information, and so you give more weight to studies that are more robust or more applicable to your situation (practical advice on applying meta-analysis can be found in Defra's value transfer guidelines here: <http://www.defra.gov.uk/environment/policy/natural-environ/using/valuation/index.htm>);
- Be honest about the major uncertainties in your analysis, and test them to see if your conclusions about the merits of one policy over another are sensitive to these uncertainties – economists can help with “sensitivity analysis”;
- Be honest about uncertainty so others do not believe your work is more accurate than it really is; this means others can use your work in their own meta-analyses in the future;
- Carefully design any new research you undertake, so your work may be useful to others through value-transfer techniques. In the long run, this will reduce uncertainty in your work.

5.3.4 Non-monetary valuation

Defra's 'Introductory guide to valuing ecosystem services'

<http://www.defra.gov.uk/environment/policy/natural-environ/documents/eco-valuing.pdf>

focuses on monetary valuation but also summarises non-monetary valuation methods and discusses their complementary role.

5.3.5. Practical guidelines and case studies on valuation:

The Defra website hosts a section with practical advice on undertaking valuation, including six very useful case studies. These focus on application of value-transfer techniques, and will be most useful for economists and other analysts looking to make better use of existing knowledge: <http://www.defra.gov.uk/environment/policy/natural-environ/using/valuation/index.htm>

Defra's guidelines on using participatory and deliberative techniques in ecosystem services valuation (due in late 2010) will provide further details on non-monetary valuation methods, and how these can be utilised alongside monetary valuation.

6. Help us to improve this guide

We hope that the resources and information in this guide help you to use an ecosystems approach in your policy work.

We plan to regularly update the guide with the latest research, case-studies and data sources so if you know of some good materials and resources that would be helpful to others then please let us know.

We would also welcome any feedback you have about the guide that will help us to improve it.

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Annex A: A policy-makers self-assessment on an ecosystems approach.

- Make sure you have **read section 4.3** before you complete this questionnaire. You may also find it useful to do the ‘**1 hour of essential reading**’ at section 5.1.1 first too.
- Read each of the 14 questions and circle the answer in the A, B or C column.
- Record any thoughts about the what you based your answer on in the template at the end of the questionnaire.
- Go back to section 4.4 to assess your results.

	A	B	C	
1. We have thought about our policy issue in relation to _____ bits of the natural environment	A few	Several	all	<p>What’s this question about?</p> <p>This question is about thinking broadly about the natural environment to help you identify if there are any high-level aspects you haven’t looked at and might want to investigate. The list of ecosystem services at Annex D might help.</p> <p>Sub-questions</p> <p>Have all aspects of the environment been looked at in relation to your policy?: water quality, water availability, air quality, landscape, biodiversity, marine, soil</p> <p>Which are the most important and why?</p> <p>How do these aspects interrelate?</p>
2. I am _____ that we understand what role the natural environment has to play in relation to our policy issue	Not sure	Partly sure	Really confident	<p>What’s this question about?</p> <p>This question is about the broad potential for the environment to interact with your policy. Specific risks and opportunities are covered later.</p> <p>Sub-questions</p> <p>What evidence about the natural environment have you used?</p> <p>What aspects of the natural environment are stakeholders concerned about?</p>

<p>3. We have identified _____ ecosystem services that play a role in our policy situation</p>	<p>0</p>	<p>1 – 10</p>	<p>11 - 25</p>	<p>What's this question about?</p> <p>You can formalise how you think about the natural environment by using an ecosystems framework to identify what the natural environment does for us. These are known as ecosystem services. Identifying the services is a key part of being able to value the contribution the natural environment makes to society.</p> <p>Sub-questions</p> <p>Have you looked across all four types of ecosystem service?:</p> <ul style="list-style-type: none"> • Provisioning (things we can use like timber, food and industrial crops) • Regulating (e.g. filtering pollution and stemming flood water) • Supporting (e.g. pollination) • Cultural (e.g. health and recreation) <p>Are there any categories that are absent or you have very little detail on?</p>
<p>4. We have _____ the scale of the geographic interactions of our policy with the natural environment</p>	<p>Not thought about</p>	<p>Given some thought to</p>	<p>Fully explored</p>	<p>What's this question about?</p> <p>This question is about thinking beyond the usual suspects in terms of geographic range of the interactions your policy might have with the natural environment. For example, a road building policy might only consider the interactions with the area immediately next to the road, but what about the area that is covered by the run-off from the road or the places where the materials are extracted to build it?</p> <p>Sub-questions</p> <p>What is the widest possible geographical impact of your policy?</p> <p>How far do populations of plants and animals extend or move?</p> <p>What is the extent of the water catchment area?</p> <p>How rare are any habitats involved?</p>

<p>5 We have identified and involved _____ of the people who will be impacted on or who have a role to play in relation to relevant ecosystem services</p>	<p>None</p>	<p>Some</p>	<p>All</p>	<p>What's this question about?</p> <p>One of the reasons that ecosystems are vulnerable to damage is that the people who benefit from ecosystem services are often not the same people who make decisions about, or impact on, the ecosystems themselves. This disconnect means that decisions are made that fail to take into account all the people who have an interest in the ecosystems and the services they provide. Involving and connecting these people can result in better decisions and ongoing relationships on the ground that facilitate good management in the future.</p> <p>Sub-questions</p> <p>Who are the people who currently benefit from the existing ecosystem services?</p> <p>Who are the people involved in maintaining them?</p> <p>How do you plan to involve them?</p> <p>Where are your stakeholders located ?</p>
<p>6. We have _____ the natural environment for potential solutions to our policy problem</p>	<p>Disregarded</p>	<p>Looked a bit at</p>	<p>Looked in detail at</p>	<p>What's this question about?</p> <p>You've probably thought about general ways in which the natural environment interacts with your policy, but this question is about identifying specific jobs that the natural environment could be doing to help deliver your policy outcome.</p> <p>Sub-questions</p> <p>How can the natural environment help you deliver your policy aims?</p> <p>Could the natural environment provide a cheaper solution?</p> <p>Could natural systems add value to man-made solutions (or vice versa)?</p>

<p>7. We have _____ identified things about the natural environment we must protect and or manage</p>	<p>Not</p>	<p>Partially</p>	<p>Fully</p>	<p>What's this question about?</p> <p>This question is about identifying the full range of environmental constraints that you could take into account from statutory designations (e.g. SSSIs) and standards to less-easily definable biophysical limits of the natural environment, such as healthy fish populations for sustainable fishing.</p> <p>Sub-questions</p> <p>Have you thought about all of the following types of constraint:</p> <ul style="list-style-type: none"> • Protected habitats, species and landscapes • National and local targets and limits for environmental standards such as carbon emissions, air and water quality and noise levels. • Biophysical limits where possible
<p>8. We are _____ of the pressures on the natural environment and how they might change</p>	<p>Not aware</p>	<p>Somewhat aware</p>	<p>Fully aware</p>	<p>What's this question about?</p> <p>This question is about looking at the particular stresses the natural environment is under in the area that your policy covers so that you can consider whether your policy options might exacerbate them or whether they might be able to help alleviate them. It is also about thinking about how those stresses might change so you can make your policy flexible and responsive.</p> <p>Sub-questions</p> <p>Have you done any horizon scanning work?</p> <p>Have you looked at:</p> <ul style="list-style-type: none"> • Climate change effects • Impact of climate change mitigation and adaption measures • Water stress • Population change • Pollution • Land use change

<p>9. We have _____ identified risks to our policy from the natural environment and how they might change</p>	<p>Not</p>	<p>partially</p>	<p>fully</p>	<p>What's this question about?</p> <p>This question is about how the natural environment can cause problems for your policy objectives and what you could do to avoid or reduce them. An example is building houses in flood risk areas where solutions could include a wider consideration of location rather than simply man-made defences.</p> <p>Sub-questions</p> <p>Have you thought about :</p> <ul style="list-style-type: none"> • Flooding • Changes in temperatures • Subsidence and erosion • Reduced availability of natural resources <p>How will you avoid or manage those risks?</p>
<p>8. We have _____ taken the value of changes to ecosystem services relative to the baseline into account in our impact assessment</p>	<p>Not</p>	<p>Partially</p>	<p>Fully</p>	<p>What's this question about?</p> <p>This question is about measuring the impact of changes to ecosystem services so that they can be compared alongside other impacts. Valuation can be both monetised and non-monetised.</p> <p>Sub-questions</p> <p>Have you attempted to find values for different types of ecosystem service?</p> <p>How have you considered both market and non-market values?</p> <p>Who's values have you used?</p> <p>Have you thought about synergies and trade-offs?</p> <p>What have you deliberately left out?</p>

<p>9. In assessing policy options we have _____ the potential to deliver other public policy objectives through ecosystem services</p>	<p>Not considered</p>	<p>Paid some attention to</p>	<p>Maximised</p>	<p>What's this question about? This question is about maximising public benefits for public spend by looking to the natural environment for policy options that will address the policy problem, but also produce other benefits to society. Areas where multiple benefits are common are where changes to land use or infrastructure can produce both biodiversity and recreational benefits.</p> <p>Sub-questions Where might environmental improvement deliver more benefits to your or wider Government objectives such as:</p> <ul style="list-style-type: none"> • Public health • Security • Social equality • Economic growth • Education • Recreation
<p>10. In assessing policy options we have _____ identified how the impact of the policy options on ecosystem services might change over time</p>	<p>Not</p>	<p>Partially</p>	<p>Fully</p>	<p>What's this question about? This question is about adaptive management of the natural environment – ensuring that your policy can take into account changes to the natural environment over time.</p> <p>Sub-questions Will your policy still work and not have unintended consequences on the environment if things change? Will improvements in knowledge and technology enhance your policy response and if so have you built in flexibility into your policy?</p>

<p>11. We have _____ the people identified in question 5 in our delivery plans</p>	<p>Not involved any of</p>	<p>Involved some of</p>	<p>Involved all of</p>	<p>What's this question about? Successfully managing and protecting ecosystems as part of a policy response is likely to involve a range of people working in new ways so it is important to go beyond the usual suspects when planning delivery.</p>
<p>12. We have _____ worked out ways of managing trade-offs between different ecosystem services or benefits</p>	<p>Not</p>	<p>Partly</p>	<p>Fully</p>	<p>What's this question about? You won't have a perfect solution so managing trade-offs is an integral part of your option appraisal / impact assessment.</p> <p>Sub-questions Have you thought about:</p> <ul style="list-style-type: none"> • The value of competing benefits and / or negative impacts • The people to whom the benefits or losses apply • Governance structures that will produce the best outcome
<p>13. People involved in the delivery chain _____ co-operatively, their part in the management of the overall system.</p>	<p>Do not understand and are not equipped to deliver</p>	<p>Largely understand, but are not fully equipped to deliver</p>	<p>Understand and are equipped to deliver</p>	<p>What's this question about? Solutions on the ground are likely to involve new or enhanced partnerships so you need to make sure that everyone understands their role and is willing and able to work with the other players.</p> <p>Sub-questions How are you enabling people to work together? Will benefits be realised on the ground for real people?</p>

<p>14. Our plans for evaluation and monitoring of our policy _____ assessing the impact of the policy on ecosystem services</p>	<p>Do not include</p>	<p>Include to some extent</p>	<p>Fully include</p>	<p>What's this question about? This question is about ensuring that you continue to think about ecosystems and the benefits they provide when you are monitoring and evaluating your policy.</p> <p>Sub-questions</p> <ul style="list-style-type: none"> • How will you monitor change in ecosystems and ecosystem services? • What's your priority for monitoring benefits?
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Template for recording thoughts from self-assessment questionnaire

Self-assessment question	Things we're currently doing well	Priority next actions	General thoughts
<p>1. We have thought about our policy issue in relation to _____ bits of the natural environment</p>			
<p>2. I am _____ that we understand what role the natural environment has to play in relation to our policy issue</p>			
<p>3. We have identified _____ ecosystem services that play a role in our policy situation</p>			

<p>4. We have _____ the scale of the geographic interactions of our policy with the natural environment</p>			
<p>5 We have identified and involved _____ of the people who will be impacted on or who have a role to play in relation to relevant ecosystem services</p>			
<p>6. We have _____ the natural environment for potential solutions to our policy problem</p>			

<p>7. We have _____ identified things about the natural environment we must protect and or manage</p>			
<p>8. We are _____ of the pressures on the natural environment and how they might change</p>			
<p>9. We have _____ identified risks to our policy from the natural environment and how they might change</p>			

<p>8. We have _____ taken the value of changes to ecosystem services relative to the baseline into account in our impact assessment</p>			
<p>9. In assessing policy options we have _____ the potential to deliver other public policy objectives through ecosystem services</p>			
<p>10. In assessing policy options we have _____ identified how the impact of the policy options on ecosystem services might change over time</p>			

<p>11. We have _____ the people identified in question 5 in our delivery plans</p>			
<p>12. We have _____ worked out ways of managing trade-offs between different ecosystem services or benefits</p>			
<p>13. People involved in the delivery chain _____ cooperatively, their part in the management of the overall system.</p>			

<p>14. Our plans for evaluation and monitoring of our policy _____ assessing the impact of the policy on ecosystem services</p>			
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ANNEX B – Self-assessment results and next steps

Mostly 'C's (right hand column)

If you, and a range of colleagues in your policy area, were able to confidently choose the right hand column for the majority of answers then you are already using an ecosystems approach to make the most of the natural environment in your policy work.

Key actions:

- Ensure that Defra's Natural Environment Strategic Unit knows what you are doing so they can share your work with others (ecosystems@defra.gsi.gov.uk)
- Look at any questions that were harder to answer or you answered A or B for and follow up on the resources at 5.2 'Resources part 2' to see what you could be doing to improve your policy or its delivery in particular areas. Note any priority actions in the template for the self-assessment at Annex A

Mostly 'B's (middle column)

If you, and a range of colleagues in your policy area, chose the middle column for the majority of answers then you are already working in a way that embraces the principles of an ecosystems approach, but your policy might benefit from going into a bit more depth to really get the most out of the natural environment.

Key actions:

- Explore the resources at 5.2 'Resources part 2' for the particular activities you are interested in to look for ways of further embedding an ecosystems approach. Note any priority actions in the template for the self-assessment at Annex A
- For policy teams in Defra and other Government Departments Defra's Natural Environment Strategic Unit may be able to provide some direct facilitation to help you. (ecosystems@defra.gsi.gov.uk)

Mostly 'A's (left hand column)

If you, and a range of colleagues in your policy area, chose the left hand column for the majority of answers then it is likely that an ecosystems approach has not been used in your policy area to date. However, there are likely to be benefits of adopting this approach – no matter what stage of policy making you are in!

Key actions:

- Read the 'One hour of essential reading to get you started' in 5.1 'Resources Part 1' and then look at 5.2 'Resources Part 2' for help with the particular activities you are interested in. Note any priority actions in the template for the self-assessment at Annex A
- Contact Defra's Natural Environment Strategic Unit to talk through where you are at and how you can begin to use an ecosystems approach in your policy work. For policy teams in Defra and other Government Departments the unit may be able to provide some direct facilitation to help you. (ecosystems@defra.gsi.gov.uk)

Annex C

Table of valuation tools and techniques

Valuation technique	Time requirement	Information requirement	When is it most useful?	What will it tell you/what will it output?	Appropriate for high-risk/sensitive policies?
Fully monetised cost-benefit analysis	Variable, depending on existing info	High	Choosing between options	Ranking of policy options, showing which has highest benefits compared to costs, and by how much	Yes, provided information is complete and high-quality
Multi-criteria analysis	High	Medium-High	Choosing between options	Ranking of policy options, showing order of options in terms of which has highest benefits compared to costs	Yes, when coupled with a monetised cost-benefit analysis. May include participative and deliberative methods
Cost-effectiveness analysis	Medium	Medium (requires knowing costs, but not benefits)	Choosing between options	Ranking of policy options, showing which is cheapest way to achieve given objective	No, unless the aim is to precisely hit a specified objective
Threshold/break-even analysis	Low	Medium (must know either costs or benefits, not both)	Choosing between options	How much you would have to believe the benefits (costs) were worth, to outweigh the costs (benefits)	In conjunction with other techniques. Requires judgements that may not be informed by analysis
Quantitative analysis (of numbers of species, time savings, survey responses etc.)	Low-medium	High	Developing options	A good sense of scale of impacts of different options, but likely that advantages/disadvantages will be expressed in incomparable units	Yes, if developed into a fully monetised cost-benefit analysis or a multi-criteria analysis to make options comparable.
Qualitative analysis (of attitudes and behaviours, surveys, case studies etc.)	Low-medium	Medium	Developing options	A rough sense of the scale of impacts of different options, but limited ability to compare between options	Yes, if developed into an analytic-deliberative approach such as deliberative multi-criteria analysis to make options comparable

Analytic-deliberative approaches	High	Medium	Developing options / Choosing between options	A good sense of scale of impacts of different options, but likely that advantages/disadvantages will be expressed in incomparable units	Yes, if a technique such as deliberative multi-criteria analysis is included to make options comparable. Can include monetary valuation approaches such as Deliberative Monetary Valuation
Deliberative approaches	High	Low	Developing options	A rough sense of the scale of impacts of different options, but limited ability to compare between options	Yes, if combined with quantitative analysis (to provide external validity), or developed into deliberative multi-criteria analysis to make options comparable
Strategic planning tools (SWOT, PEST, etc.)	Medium	Low	Assessing the state of existing knowledge	A good sense of the decision-making context, and a summary of expert opinion.	Yes, as part of a range of inputs to other tools for “developing options” and “choosing between options”
Meta-analysis	Medium	Medium	Assessing the state of existing knowledge	An informed view on/weighted average of results from existing studies of relevance to the policy	Yes, as part of a range of inputs to other tools for “developing options” and “choosing between options”
Literature reviews/Desk research	Low	Low	Assessing the state of existing knowledge	Discussion on the state of knowledge in existing studies of relevance to the policy	Yes, although meta-analysis is preferable if there is sufficient existing information

Annex D – Ecosystem Services provided by UK ecosystems with examples of valuable benefits to society and the economy, adapted from the UK National Ecosystem Assessment.

Ecosystem service type	Primary & Intermediate Ecosystem Services and processes	Final ecosystem services (example of goods)
Provisioning		<p>Crops, plants, livestock, fish, etc. (wild & domesticated) (food, fertiliser)</p> <p>Water quantity (potable water, Industrial use of water)</p> <p>Trees (timber, avoidance of climate stress)</p> <p>Wild species diversity inc. microbes (natural medicine)</p>
Cultural		<p>Meaningful places (aesthetics, recreation, tourism)</p> <p>Socially valued landscapes, waterscapes and wildlife (aesthetics, recreation, tourism)</p>
Regulating	<p>Climate regulation</p> <p>Pollination</p>	<p>Climate regulation (avoidance of climate stress)</p> <p>Waste breakdown & detoxification (pollution control, waste removal)</p> <p>Hazard regulation – vegetation & other habitats (flood protection)</p> <p>Purification (clean air, clean water, clean soils)</p> <p>Wild species diversity inc. microbes (disease and pest control)</p> <p>Water quantity (flood protection)</p>
Supporting	<p>Weathering</p> <p>Primary production</p> <p>Decomposition</p> <p>Soil formation</p> <p>Nutrient cycling</p> <p>Water cycling</p> <p>Ecological interactions</p>	