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Towards a deeper understanding of the value of nature

Encouraging an interdisciplinary approach towards evidence about the value of the natural environment

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Nobel House, 17 Smith Square London SW1P 3JR

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Further information

Requests for further information can be sent to the Natural Environment Strategic Unit.

which leads this work within Defra:

Email: ecosystems@defra.gsi.gov.uk

Post: Natural Environment Strategic Unit,

Area 3D, Nobel House,

17 Smith Square, London SW1P 3JR.

This document is available online at:

http://ww2.defra.gov.uk/environment/natural/ecosystems-services/

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1. Introduction

This document sets out an initial analysis by Defra of the evidence base supporting the valuation of the natural environment and the application of an ecosystems approach to policy development and decision making. It recognises the enormous breadth of evidence that is needed to embed this thinking into policy and decision making in government and in society. It also discusses the variety of routes by which this highly interdisciplinary evidence can be gathered, consolidated and utilised to support Defra's priority of helping to enhance the environment and biodiversity to improve the quality of life.

It is designed to stimulate discussion with others who generate or gather evidence about the most effective ways of strengthening this wide ranging and complex evidence base. These discussions seek to improve Defra's understanding of:

- The wide variety of evidence already available
- The evidence gaps that should be a priority for filling and by whom
- How we can work innovatively in partnership to address evidence needs
- How we can create greater added value from evidence activities

Specifically, we welcome your feedback in two key areas:

- **1. What should be our top priorities** amongst the evidence gaps highlighted in this document, where they may be priorities for other organisations, and any initiatives planned or already underway to address them.
- 2. New ways of generating this evidence, and how we can increase the value of these evidence gathering activities both to the Defra Network and to other parties involved in helping to enhance biodiversity and the environment to improve quality of life.

It is published now to coincide with the publication of the first emerging results from the National Ecosystem Assessment¹, The Countryside Survey's Integrated Assessment², and the final reports from The Economics of Ecosystems and Biodiversity³, all of which are raising awareness in this country and abroad of the value of the natural environment.

As recognised in Defra's Evidence Investment Strategy⁴, this is a forward looking, strategic agenda and will form a key theme of the Natural Environment White Paper⁵. The results of the discussions stimulated by this document will inform the final evidence plan for Defra's Natural Value Programme and it is hoped will generate material for inclusion in the White Paper in Spring 2011.

⁴ Available at: http://www.defra.gov.uk/evidence/science/how/documents/eis-100126.pdf

¹ For further information see: http://uknea.unep-wcmc.org/

² Available at: http://www.countrysidesurvey.org.uk/

³ Available at: www.teebweb.org/

⁵ For further details see: http://www.defra.gov.uk/environment/natural/documents/newp-discussion-260710.pdf

2. Policy context

Putting the value of the natural environment at the heart of policy making forms a key part of the Coalition Government's aim to be the 'Greenest Government ever'⁶. Analysis from The Economics of Ecosystems and Biodiversity (TEEB) initiative suggests that, globally, the degradation of our planet's ecosystems is costing us €50 billion each year. This therefore is an agenda relevant across Government and beyond as the services we get from nature 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 that policies have on the ability of our natural systems to function can therefore help increase their resilience, and decrease risks or costs from failing natural systems or degraded natural resources.

This importance is reflected in Defra's structural reform plan⁷, which states that a priority for Defra is to "help to enhance the environment and biodiversity to improve quality of life". This both recognises the importance of the natural environment to our continuing economic and social prosperity, and also the challenges we face in managing our natural environment in changing times.

Defra's Evidence Investment Strategy therefore recognises that collecting the evidence needed to enable us to respond to pressures on the natural environment is vital. It also recognises the need to do more to understand the role of different parts of natural systems in providing or supporting different ecosystem services⁸, and the need also to embed a more systematic "ecosystems approach" into policy making across Government to turn this understanding into improved policies and actions.

To support these priorities, Defra is undertaking a programme of work to:

- Enable the value of ecosystems (natural capital) and the services and resources they provide to be properly reflected in decision making, the economy and markets.
- Encourage and facilitate the integrated management of assets and services at the most appropriate spatial scales.
- Explore new options for incorporating these concepts into the work of Government and the wider economy.
- Prioritise and fill critical gaps in the knowledge base through the most appropriate mechanisms.

Achieving these objectives requires cooperation with and between Defra policy programmes and the Defra Network. Policy areas such as climate change

http://www.defra.gov.uk/environment/natural/documents/newp-discussion-260710.pdf

⁶ For more details, see the discussion document for the forthcoming Natural Environment White Paper:

⁷ Available at: http://www.defra.gov.uk/corporate/about/what/documents/defra-srp-100716.pdf

⁸ Ecosystem services can be defined as services provided by the natural environment that benefit people: for more detail see http://www.defra.gov.uk/environment/policy/natural-environ/documents/healthy-nat-environ.PDF

adaptation, air quality, farming, marine, soils, water and floods, landscape, and biodiversity are all linked to different extents with this agenda, although each has different evidence needs. Furthermore, this subject is of direct relevance to a range of other Government Departments and in some cases they are making considerable investment in evidence in support of this with which Defra can engage. Finally, evidence generated by public bodies will support the efforts of private and third sector organisations in incorporating the value of the natural environment into their own work, and evidence generated by them as they do this will also be of value to Defra and its partners.

The evidence supporting the Natural Value Programme will underpin the development of various parts of the Natural Environment White Paper, for publication in Spring 2011, and actions for strengthening this evidence base may also form part of that document.

3. Expected benefits

Investing in the evidence base in this area will support our ability to make the value of nature more relevant to a variety of stakeholders, through a diversity of projects that address different policy situations and sectoral interests. It will enable a more robust and complete incorporation of the natural environment into policy and economic decisions by enabling interested parties to access interdisciplinary research which joins up the expertise of the UK's natural science and economic/social science research communities.

Encouraging research in this area will help to generate a broader "community of practice/expertise" amongst those in the public and private sectors trying to investigate and implement an ecosystems approach in a variety of evidence, policy and delivery situations. This will also test the robustness of current data sets and monitoring activities for application to new policy questions, which will in turn inform decisions on the need for future collection of some long term data sets.

4. Current and future evidence supply

There is a very wide evidence base relating to ecosystems and the services they provide to society provided by Defra programmes, the Defra delivery network, Whitehall departments, research councils and other national and international programmes. Details of some of these programmes are provided at Annex A.

The conceptual framework of the National Ecosystem Assessment (Figure 1) helps to define the overarching evidence challenge. To make effective policy and decisions that truly take account of the value of ecosystem services to human wellbeing, it is necessary to have a sound evidence base that covers all steps of the NEA conceptual framework. Therefore, in analysing the current evidence landscape and future requirements, evidence activities have been categorised into six broad themes which together provide coverage of the complete cycle of the conceptual framework.

This analysis, together with the opinions of Defra Network members, suggests that there are evidence requirements in all six themes, with considerable emphasis on the need for further engaging with the social science community and sub national initiatives to tackle some of these gaps.

These six themes are therefore outlined below along with a summary of current work taking place under each and example projects being undertaken across the landscape. A statement capturing some of the proposed gaps is also given for each of these themes as a stimulus for further discussion on the importance and accuracy of these statements.

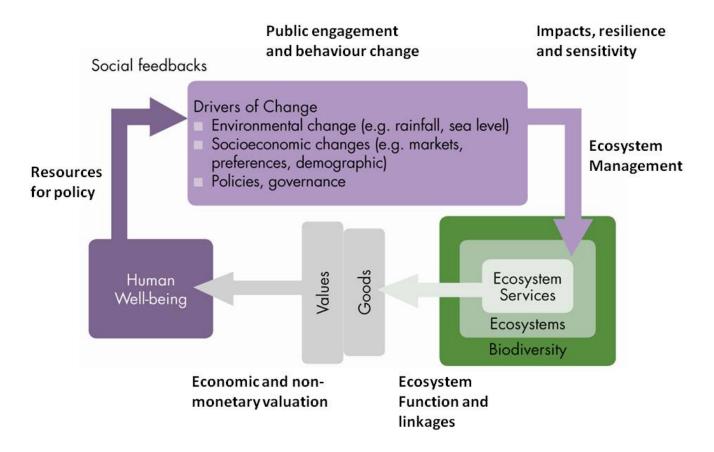


Figure 1. Adapted from the conceptual framework of the National Ecosystem Assessment, showing different evidence gathering themes required to build a robust evidence base for taking account of the value of nature to society and the economy.

4.1 Evidence theme 1:Understanding the economic and noneconomic value of ecosystems and the goods and services they provide

Scope of current work

There is active work describing and, quantifying the benefits to different parts of society from terrestrial, freshwater and marine ecosystems. This work includes estimation of changes to ecosystem service provision and associated benefits (both market and non-market) resulting from changes to policies and management

practices. Work is also taking place to assess the interactions of policies and schemes with an environmental/resource efficiency focus for businesses.

Example projects

- An examination of the UK biodiversity benefits that are expected to result from the proposed reduction in lowland peat extraction.
- Adopting the Ecosystems approach for fisheries management, including a preliminary estimate of value and non-value aspects of the marine environment
- Research into the benefits (financial and social) seen by SMEs when implementing Environmental Management Systems.
- Research into the use of the ecosystem services approach to value air quality

Future Evidence requirements

Further work is needed to understand how people currently value the natural environment and how these values (monetary and non-monetary) might change in the future. Further valuation is needed in specific areas, such as in the marine environment, impacts from air quality changes and the costs/benefits from natural capital maintenance. Currently evidence supporting the valuation of/accounting for natural resources and services does not enable the private sector to build a business case for taking greater account of these resources in their business models in the majority of cases.

4.2 Evidence theme 2: Resources to enable others to embed an ecosystems approach in policy and decision making

Scope of current work

Case studies are looking at the costs/benefits of applying the ecosystems approach in practice. There is research and development of tools for monitoring/mapping the marine and terrestrial environment, for assessing ecosystem health and assessing where improvements can be made. Tools are also being developed for monetary and non monetary valuation both on a sectoral basis (e.g., by businesses and NGOs) and across Natural Environment systems.

Example Projects

 Demonstrating the value of taking an ecosystems approach through four local initiatives⁹:

- Participatory and Deliberative techniques for embedding an ecosystems approach in decision-making.
- Development of practical guidelines for environmental valuation in policy appraisal using Value Transfer techniques
- Case studies to help support embedding and develop the Value Transfer guidance. This includes case study projects that will help fill the gap around lowland and urban contexts.

⁹ Initiatives are **i**. The Gaywood River Valley, **ii**, Natural Economy Northwest Green Infrastructure, **iii**. Finding Sanctuary Project (Marine Protected Area) **iv**. The Wetland Example of Payments for Ecosystem Services (WEPES): River Fal

Mapping of tools and methodologies to allow businesses to manage their impacts on biodiversity

Future Evidence Requirements

Considerable resources are available to help different sectors embed this thinking. However, there is limited understanding of the effectiveness and efficiency of specific delivery mechanisms (e.g. payment for ecosystem services; regulation, incentives, markets, land purchase) and how these mechanisms operate in concert.

A key gap also lies in how decisions can/should be taken in the face of uncertainty and the most appropriate methods of making policy without a "complete" evidence base.

4.3 Evidence theme 3: Public engagement and behaviour change

Scope of current work

Understanding and supporting the behaviour of individuals and organisations to adopt behaviours that impact positively on ecosystem services.

Example Projects

- Citizen engagement in policy making in the development of and consultation on the River basin management plans under the water framework directive.
- Encouraging more pro-environmental behaviours amongst Small and Medium sized Enterprises.

Future evidence requirements

There is insufficient evidence sourced from a local level on how organisations and communities interact around issues concerning the natural environment. There are gaps in our knowledge of the benefits and costs of community led ecosystems projects and our understanding of what motivates or prevents individuals, groups of individuals or decision makers from participating in ecosystems delivery. More generally, our understanding of how behaviour can be influenced concerning the environment to help deliver what society wants and the effectiveness of language and communication is still limited.

4.4 Evidence theme 4: Impacts on ecosystems, their resilience and sensitivity

Scope of current work

Improving our understanding of how climate change, individual activities or chemical/biological emissions affect the functioning of terrestrial, freshwater and marine ecosystems. This includes work to develop markers/methodologies for understanding ecosystem disturbances and for long term monitoring.

Example Projects

• Systematic review of evidence relating to ecosystem resilience to external environmental pressures.

- Reviewing evidence of what makes some soils more resilient to change, to evaluate what this means for soils in England and Wales, and to provide an initial assessment of the extent to which resilience can be conferred to soils
- Scoping work linked to the commitment in the recent Government Economic Service Review of the Economics of Sustainable Development¹⁰ to develop an 'asset check' for natural capital to assess the potential of policies to deplete critical natural assets.

Future Evidence Requirements

A key evidence gap is understanding and appraising pressures on and risks to ecosystems in *future* (arising from, e.g., climate change, atmospheric pollution deposition, wildlife disease and changes to agriculture). There are changes at a genetic level which need to be understood for better planning of long term management of habitats (e.g. in forest systems) and changes at landscape scale (habitat fragmentation, gene flow) which could also affect resilience.

4.5 Evidence theme 5:Management of ecosystems and the services they provide

Scope of current work

Practical demonstrator projects are investigating the management of ecosystems for multiple services, with different primary focuses (e.g. flood risk reduction, water quality), including work on governance and financing. There is also work assessing impacts of policy and management drivers on ecosystems and the services they deliver including linkages and tradeoffs between ecosystem services.

Example Projects

- Using test catchments to study farm practices for water quality
- Delivering Nature's services: using three upland areas to pilot an ecosystems approach to land management
- Multi-Objective Flood Management Demonstration Project Scheme, to demonstrate and promote the contribution that land management can make to managing local flood risk.
- Barriers and opportunities for use of payments for ecosystem services. This study considers behavioural change and is also highly relevant to work undertaken under Theme 1 on valuation.

Future Evidence requirements

Greater understanding is needed on the bundle of services that can be delivered simultaneously by specific ecosystems, and how physical location influences management of services. Where management of multiple ecosystems or services is challenging, the tradeoffs need to be better understood between different options in order to optimise the benefits to social well being.

¹⁰ http://www.defra.gov.uk/evidence/economics/susdev/index.htm

4.6 Evidence theme 6:Examining the linkages/interactions between ecosystems and the services they provide.

Scope of current work

Some fundamental work investigating how changes to ecosystems impact on the delivery of multiple services, and how management can influence the range of ecosystem services provided.

Example Projects

- Managing Grassland Diversity For Multiple Ecosystems Services
- NERC/BBSRC evidence work on the importance of landscape for biodiversity

Future Evidence requirements

There are considerable gaps in our knowledge within the scope of this thematic area. Whilst scientific data may currently exist, it has not necessarily been analysed to answer questions on how the structure, composition and function of ecosystems affect service delivery, including how services and ecosystems interact over different spatial scales. There are also evidence needs in understanding of the cumulative impacts of anthropogenic activities on ecosystem goods and services, particularly in the marine environment, but also in different terrestrial and freshwater systems.

Defra welcomes feedback on what should be our top priorities amongst these evidence gaps, where they may be priorities for other organisations, and any initiatives planned or already underway to address them.

5. Approach to meeting ongoing evidence needs

Defra needs to employ methods for commissioning, co-ordinating and managing evidence which produce a compelling evidence base in a cost-effective manner. The evidence teams across the Defra Network with an interest in the value of the natural environment will ensure their evidence work is joined up to maximise synergies between evidence activities. This includes the broad range of capabilities, both internal and external to the Department, on which this evidence base depends in order to address novel evidence challenges and the gaps outlined above.

In order to develop evidence efficiently, Defra will focus on working in the following interconnected ways to meet its evidence requirements:

5.1 Promoting interdisciplinary evidence gathering activities

The range of evidence-related disciplines important to this agenda is very wide, and draws heavily from the natural, economic and social sciences. Of utmost importance, however, is the ability for these different disciplines to interact and work effectively together to answer the "new" policy questions demanded of them by different policy areas taking up an ecosystems approach.

Future evidence activities will be developed in liaison with economic analysts, social researchers and their policy colleagues and will call for collaboration between academics with expertise in the natural, social and economic sciences.

5.2 Placing more emphasis on secondary evidence

Drawing on secondary research, commissioned either in the UK or at international level, has the potential to increase the value of existing primary research which can help answer policy relevant questions. This may have been gathered in support of other areas of public policy or for different scientific reasons (e.g. health, tourism, community participation, behaviour change etc.), but may add significant value when translated for use in the context of the natural environment. It will still be necessary to commission primary research when it is clear that existing evidence isn't available, and it will be important to draw on the expertise within different organisations to ensure this is commissioned in a way that maximises its value and applicability to a variety of applications.

5.3 Encouraging partnerships across the Defra Network and beyond

The analysis of the evidence landscape identified a number of common evidence gaps which are relevant both to Defra and to other organisations. Therefore Defra will continue to work in partnership across the Network and with external organisations to pool technical expertise and resources in the commissioning of new projects. This will generate a better understanding of the objectives of different organisations so that synergies between them can be exploited to maximise value for money of research investments. We need to continue to broaden the range of organisations involved in this work.

5.4 Encouraging knowledge exchange

With so many potential evidence sources, enhanced knowledge sharing has the capacity to add significant value to existing evidence activities. Defra will therefore look at a range of approaches to enhance knowledge sharing.

Defra will seek to develop stronger networks for exchanging intelligence within the Defra Network and wider partners on where, for example, an ecosystems approach is being applied and successes being achieved or barriers being faced. This will include working with organisations on projects operating at the sub-national level, across different policy areas, where these are of direct relevance to policy or delivery. We should also make better use of existing knowledge-sharing networks at national and international level to supplement the evidence base.

Defra will support initiatives that maintain interdisciplinary networks of experts, to obtain advice and ensure high levels of knowledge sharing amongst the diverse research community. This may take the form of place-based research platforms which can both provide sites for studying ecosystem service management in practice, and also enable the sharing of project outcomes across different places, disciplines and policy areas and hosting knowledge exchange workshops involving leading figures from the scientific/academic community. The Defra network partners would also be key participants at these workshops.

Defra welcomes ideas for new ways of generating this evidence, and how we can increase the value of these evidence gathering activities both to the Defra

Network and to other parties involved in helping to enhance biodiversity and the environment to improve quality of life.

6. Next steps

Over the coming months, Defra will be holding conversations with key organisations that feed into the evidence base for the programme to discuss how we can work effectively and innovatively to strengthen this evidence base. There may be further opportunities for engaging a wider audience through workshops focussing on this issue before Christmas, and any thoughts can be sent to <<ecosystems mailbox>> before the end of November.

Annex A

The current evidence landscape: a brief analysis.

The evidence landscape required to support the delivery of this agenda is complex, involving programmes within Defra, across the Defra Network, and external to the Department. The following summary of the current evidence supply has therefore been developed with assistance from the Defra Network, policy areas within Defra and using evidence from a workshop addressing the Ecosystem Services Evidence Challenge set out in Defra's Evidence Investment Strategy and the Evidence Landscape project¹¹.

A key project involving several of these internal and external partners is the National Ecosystem Assessment. This is the first analysis of the UK's natural environment in terms of the benefits it provides to society and future economic prosperity. It brings together a large interdisciplinary team of social, economic and natural scientists to collate and reanalyse existing evidence on the state and value of our natural environment and the services it provides and will generate information for advocacy, new methods of analysis, and a clearer view of the evidence base vital to supporting this agenda.

Evidence in the Defra Network is a mixture of organisational expertise, monitoring work, internal evidence synthesis projects, and externally contracted R+D. The large amount of monitoring data developed and held by Network members is a key resource that underpins the aims of the programme, allowing changes in ecosystems to be monitored through time (although much of this will need re-analysis to give information on ecosystem services). Forestry Commission, the Environment Agency, British Waterways, Natural England, and JNCC have all undertaken (and in many cases are still involved in) research on ecosystem services, either taking the lead (as in the EA case studies or the NE demonstrators work), or working in partnership with other organisations (e.g. in the floods multi-objective demonstrator projects).

Defra programmes such as Food and Farming, Air Quality, Biodiversity, Soils, Environmental Stewardship, Floods, Water Quality, and Marine are all commissioning research into ecosystem services, valuation, or managing the environment as a system. This is supported by evidence directly commissioned by the Natural Value Programme evidence workstream, which focusses on cross cutting issues, the development of resources and the collation of evidence sets to enable others with a more specific policy focus to apply this approach to their work. The current analysis has identified over 90 projects currently being undertaken by the Defra Network in this area of various sizes and relatedness to the value of the natural environment and an ecosystems approach.

 $\underline{http://randd.defra.gov.uk/Default.aspx?Menu=Menu\&Module=More\&Location=None\&Completed=0\&ProjectID=16542\#RelatedDocuments$

¹¹

Other Government Departments have also funded or are funding relevant research which is focused on delivering their own policy objectives. Examples include research into the application of the Strategic Environmental Assessment in CLG and work on landscape valuation in DfT. Most significantly, however, currently is the joint work between NERC, ESRC and DfID on international issues through the Ecosystem Services for Poverty Alleviation (ESPA) programme.

The Devolved Administrations are also funding research and demonstration projects of direct relevance in addition to their respective contributions to the National Ecosystem Assessment. Although all demonstrators are place-specific, there is much to be gained by closer collaboration between countries in this area to maximise the lessons learned from each project about the practical application of an ecosystems approach.

The evidence that supports this agenda is greatly enhanced by the work of the Research Councils (focused through initiatives such as the Living With Environmental Change partnership). For example, ecosystem services and their relationship to biodiversity forms part of one of the research themes in NERC's research strategy for the period 2007-12, with key NERC programmes including Biodiversity and Ecosystem Service Sustainability, Valuation of Biodiversity and Natural Resources, and the Insect Pollinator initiative. There are several projects funded through the RELU programme (ESRC,BBSRC, NERC, Scottish Govt and Defra) that are of direct relevance, and both NERC and ESRC are contributing to the NEA. The work of the research councils will continue to be vital to increase our understanding of the fundamental science and economics that underpins the application of an ecosystems approach to a wide variety of policy and decision making situations.

The evidence base is further strengthened by research funded at EU and international level, e.g. through Framework Programmes 7 and 8, which both contain calls that relate to ecosystem service delivery. Defra is providing a contribution to the BIODIVERSA programme to complement a larger amount from NERC in support of a number of projects which are relevant to the NVP evidence base. Defra is also actively engaging with specific EU proposals e.g. TEEB, EURECA, and the PRESS project, providing expertise and evidence from UK research. In future we will explore further opportunities that may arise through contributions to the Intergovernmental Platform for Biodiversity and Ecosystem Services (IPBES). Evidence that is being gathered outside Europe, for example by the World Resources Institute in the USA could also greatly supplement this evidence base in an economically-efficient manner. These wider sources merit further investigation.

The evidence base is further enriched by the work of independent organisations, both internationally, e.g. World Business Council for Sustainable Development and nationally e.g. the National Trust, and the Royal Society for the Protection of Birds. Defra will continue to liaise with these organisations to ensure that we maximise opportunities for benefitting from each others' evidence work.

Finally, to monitor change, Defra relies on a large number of data sets provided by several cross cutting initiatives. In the marine area, Charting Progress II has recently provided a comprehensive update of the status of marine ecosystems in UK waters. The Earth Observation Network (EONet) provides a useful data network for Defra to

access. The Environmental Change Network, a partnership of NERC, BBSRC, the Defra Network and the Devolved Administrations is generating long term datasets over many sites around the country to monitor changes in various environmental parameters. Similarly, the Countryside Survey (funded by NERC, Defra Network and the Devolved Administrations) also is generating valuable data which will enable better integration of environmental change into policy and decision making, with the Integrated Assessment being of particular relevance to this agenda. Many of these data sets are helpfully reanalysed and presented by the various "state of" reports produced by the Defra Network, and the National Ecosystem Assessment will produce a summary of the particular datasets or providers of evidence which were very important to the assessment of the UK's ecosystem services. This is also likely to include non-environmental data sources such as ONS figures on the economic performance of different sectors, or national tourism surveys.