

WORKSHOP OUTPUT

BES-Defra Workshop **Assessing Ecosystem Services in the UK** 8 December 2006, London, UK

Executive Summary

Background

The purpose of the BES-Defra workshop was to discuss how to assess the state of ecosystem services in the UK in order to inform public policy. The majority of the workshop participants were ecologists, but there were also policymakers, economists and social scientists present.¹ The workshop was chaired by Professor Georgina Mace (Imperial College London) and Professor David Raffaelli (University of York). This report provides a summary of the workshop presentations and discussions.

Key points

- The Millennium Ecosystem Assessment (MA) provides an important framework to assess the state of the UK's ecosystem services. The Living with Environmental Change initiative should enable the UK to become a world leader in addressing the challenges posed by the MA and climate change.
- In order to understand changes to ecosystem services, ecologists will need to refocus their research questions to give greater consideration to how ecological processes contribute to human wellbeing.
- There is considerable scientific knowledge, data and tools that can be utilized to assess ecosystem services, but there are also gaps. Preliminary ecosystem assessments will be useful for identifying gaps and research priorities.
- Long-term monitoring is crucial to understanding changes to ecosystem services and the ecological processes that underpin them.
- In order to address the challenge of ecosystem services there needs to be collaboration between natural and social scientists from the outset. Changes to the scientific system are needed in order to make collaboration successful.
- Policymakers, business and other user-groups need to be engaged in the process to ensure that outputs are relevant to their needs. All interested parties should work to communicate the importance of ecosystem services to the public and other audiences.

Further information

Nick Dusic
Science Policy Manager, British Ecological Society
Telephone: 020 8871 9797
E-mail: nick@britishecologicalsociety.org

¹ See page 10 for the full list of participants.

Summary of Presentations and Discussions

Introduction

Summary of presentations

The MA framework and Living with Environmental Change

Professor Georgina Mace discussed how the Millennium Ecosystem Assessment (MA) framework was developing a new science and new approaches in the UK. First, she explained the MA process and its key findings. The first key finding was that humans have made unprecedented changes to ecosystems in recent decades to meet growing demands for food, fresh water and energy, which has weakened nature's ability to deliver other key services such as purification of air and water and protection from disasters. The second key finding was that pressures on ecosystems will increase globally in coming decades unless human attitudes and actions change.²

She went on to discuss how Research Councils and Government Departments were planning to respond to the MA and other developments, like the Stern Review, through a new science initiative called *Living with Environmental Change* (LWEC). The output of LWEC would be world-leading interdisciplinary probabilistic prediction and analysis of climate and environmental change at spatial and temporal scales needed for managing the economy. In order to make this happen we would need:

- Better science-based understanding of environmental change, its causes and impacts.
- Better predictions with clear information about the nature and extent of uncertainties.
- New solutions to mitigate change and to adapt to it
- New ways of working in larger, collaborative teams which included multiple disciplines

Rationale and objectives for the workshop

Professor David Raffaelli discussed the context of the workshop and the outcomes that were planned from it. He noted that many countries were considering how to respond to the MA's findings and that Defra was taking a lead in this area by carrying out a number of scoping studies.³ The BES's involvement in this area of work was important because it comprises the most substantial community of ecologists and environmental scientists in the region. BES members will respond to research calls and most of the research and assessment will be done by them.

He explained that the purpose of the workshop was to take a fresh look at the topic and identify how BES member could contribute to the agenda, what kind of data will be needed, and what types of knowledge and partnerships will need to be created to make it happen. Ideally the workshop will result in an increased awareness in the BES community of this area of work and the beginning of consortia to take these ideas forward. The BES will also publish an Ecological Issues booklet on the subject, and look into the possibilities of supporting its development through its other activities (e.g. meetings, grants, publications).

² <http://www.maweb.org/en/index.aspx>

³ <http://www.defra.gov.uk/wildlife-countryside/natres/index.htm>

Linking ecosystem processes and services

Summary of presentation

Dr Phil Warren started the discussion on linking ecosystem processes and services by reviewing the research examining the relationship between biodiversity and ecosystem function. He made a number of observations about biodiversity and ecosystem function research. First, there are significant scientific difficulties in generalizing the results of most of the experiments. Second, we know little (or nothing) about effects of diversity on most processes, in most systems. Third, biodiversity-ecosystem function experiments ask a very specific question. Fourth, most experiments are at scales that are experimentally tractable rather than ecologically relevant. Fifth, just because we can measure a process doesn't make it a service. Sixth, many ecosystem services are delivered at a point, but derive from combinations of processes at wider scales. He concluded that a lot of ecological research in this area was not helping us understand the links between ecosystem processes and services in a comprehensive way.

He then outlined a number of key research questions that ecologists could investigate to improve our understanding between ecosystem processes and services.

- What are the critical ecological elements underpinning the sustainable provision of a service?
- At what scales are services generated, and how do we integrate the role of diversity effects at those scales?
- What are the interrelationships and trade-offs among services?
- What are the feedbacks between species diversity and ecological processes?
- How will diversity be affected by managing for ecosystem services?

Summary of break-out group discussions

Developing a service approach to ecology

Many of the groups agreed that it was important to focus on the underlying processes that support ecosystem service provision. This approach would mean that research should be centered on specific ecosystem service(s) and then work towards understanding the ecological processes (both biotic and physical) that enable them. The Millennium Ecosystem Assessment provides an overarching framework for analysis, which can be utilised by scientists, policymakers and other interested parties.

There was a general feeling that this approach would be a change in focus from most of the current biodiversity centric research. Taking a biodiversity centric approach to ecosystem services could miss key linkages as individual species are not always the most important units of ecosystem function. However, it was noted that the role of biodiversity should not be left out of studies.

Defining ecosystem services

It was thought that the definitions of terms used in the ecosystem service discussions needed to be clarified as they are sometimes used differently. Although most people agreed with basic MA framework, some economists have raised issues with its inclusion of certain ecosystem services that could lead to double counting. A clearer definition of what is an ecosystem process and what is an ecosystem service is needed.

There may need to be some geographical contextualization of specific ecosystem services, as communities might derive different benefits from their local ecosystems. It was noted that the MA's sub-global assessments adapted the MA's framework to

consider local conditions. Although it was agreed that having a clear framework and definition of terms was an important first step towards building a science community in this field, a degree of pluralism was also needed.

Improving predictive ability and management decisions

Another theme raised by most groups was the need to improve the predictive power of ecology. It was thought that moving the focus from observational approaches to the analysis of causes of change in ecosystem services would enable better management decisions. Ecologists would need to create predictive empirical models that were useful to stakeholders.

Many groups discussed the importance of looking at how human interventions would affect the provision of ecosystem services. This was seen as an important starting point for framing research questions. Adaptive management was discussed as an important tool in this area; so that as more information is collected, management decisions could be improved.

Groups discussed the need to understand both marginal change and critical thresholds to the provision of ecosystem services. Overall the need is to understand if a system is changing and how it impacts on human wellbeing. To understand these changes both experimental studies and long-term monitoring would be needed. There may well be a need to calculate ecological production functions for ecosystem services.

One group discussed looking at how human interventions could improve ecosystem service provision. This would mean a more ecological engineering approach. It was suggested that ecologists don't have a strong problem solving ability or a tradition of intelligent approximation. Rectifying this might include the development of black box tools that would be useful to managers.

Multi-service, multi-scale

The recognition that different ecosystem services are delivered from ecological processes at the very local scale to the global meant that research projects needed to be appropriately framed in terms of spatial scale.

It was thought that large-scale interdisciplinary experiments, most likely done at the catchment-scale, would be extremely useful in understanding the relationship between ecosystem services in a given area. The PopNet upland manipulation experiments were cited as an important example of work in this area.

Use of existing data

Two groups thought that it would be possible to use existing data to link ecosystem processes to services while one thought it would be difficult. It was felt that for certain ecosystems there is a large body of evidence that can be assessed. There is a need for funding to synthesize existing data to provide stakeholders and research customers with more useable information. By doing an initial assessment one could identify gaps in knowledge that would hinder prediction and thus decision-making. Research funding could then be targeted at filling those gaps.

Producing ecological data that social scientists can use

There was a strong recognition that an ecosystem services approach requires a focus on both ecological processes and valuation of ecosystem services. This requires that certain

parts of the ecological evidence-base needs to be useable by social scientists and economists. It also requires that economists and social scientists are active participants in projects from the beginning.

Risk Assessment

Throughout many of the discussions analogies related to health or safety were used as a proxy for understanding ecosystem services and human well-being. This included thinking about risk assessment. Assessing the risk to different ecosystem services would be one way of prioritizing work in this area. This would enable governments to know where risks are highest and choose an appropriate response.

Policy Relevance

There were general discussions about ensuring that work on ecosystem services was relevant to policymakers, businesses and other end-users. Moreover, it was highlighted that enough resources must be given to projects to ensure that their findings are communicated effectively to policymakers and other relevant audiences.

Co-ordination

Due to the demands of doing this type of research it would mean that fairly large research consortia would be necessary to address these issues in a collaborative and co-ordinated way. Individual discrete pieces of work would need to be fed into the larger project.

Monitoring for ecosystem services

Summary of presentation

Dr Dan Osborn gave the presentation in Professor Bill Sutherland's absence due to illness. He started by saying that monitoring is good at detecting changes in measured variables and trends in environmental conditions over time, but it is often not sufficient to determine how to correct change or, in the right circumstances, encourage it. Most monitoring focuses on individual species and there are only a few monitoring schemes that focus on multiple variables (e.g. Countryside Survey, Environmental Change Network). Monitoring for ecosystem services requires an active approach that will inform evidence-based management. This would mean (1) identifying a problem, (2) reviewing evidence, (3) identifying (un)certainities, (4) identifying solutions/options, (5) implementing, (6) monitoring, (7) going back to (1) and repeating as appropriate. Monitoring would enable policymakers and managers to make better decisions to support the provision of ecosystem services under this model.

Summary of breakout group discussions

Key features for monitoring ecosystem services

Monitoring needs to be objective driven (i.e. we need to know if we are getting near to what we want to know). Therefore, to monitor ecosystem services it is important that it takes a 'service oriented approach' that links ecological processes and services, as discussed in the previous section.

Monitoring for ecosystem services should be useful for both management/policy and science. It should identify changes in state, guide management/policy and test scientific theories. It should also enable scientists to link drivers of ecosystem service change to changes to human well-being. Policy interventions to improve the delivery of ecosystem services should be monitored to assess their effectiveness.

Monitoring should be part of a suite of activities which will enable an evidence-based assessment of the current state of ecosystem services. There is a need to examine the current evidence-base to see if we have sufficient knowledge to make a preliminary prognosis and to identify gaps in knowledge.

Monitoring needs to help provide an early-warning of adverse changes. This would mean that it would have to be integrated with knowledge of ecological processes and prediction. Knowing that something adverse has happened is too late for policymakers and society to react. Consideration needs to be given to time lags between changes to an ecological process and the provision of an ecosystem service.

Monitoring should help to identify acceptable limits and critical thresholds to ecosystem services. Science needs to improve its ability to predict when the degradation of an ecosystem service might cause a human crisis. It is important to involve social scientists in these discussions, as a crisis depends on what society wants and values. Therefore there is need for interdisciplinary working groups to develop meaningful targets or a range of acceptability for the provision of different services.

It was suggested that there was a need to move away from sectoral targets (i.e. one environmental component or single ecosystem service) to a more integrated approach. A multi-service approach would be crucial to showing the relationship between ecosystem services. There can be both positive and negative effects on other ecosystem services when one ecosystem service is managed for, so understanding the relationship between services is important.

Monitoring for ecosystem services needs to be well designed in terms of spatial and temporal coverage. The data from monitoring systems needs to be accurate, comparable, appropriate and accessible. It also needs to provide timely and relevant information to policymakers.

Improving what is in place

There are different traditions of monitoring in marine, freshwater and terrestrial ecosystems. It was suggested that ecologists are currently good at monitoring individual components of ecosystems. For example, farmland birds are well monitored and act as a good indicator of process based change. However, there is a need to collect more information on a wider set of ecological components and processes so that there is clearer understanding of what is happening to ecosystem services over time.

There was a general feeling that there are datasets and maps that need to be brought together so that they are more relevant and integrated. Some long-term datasets will be important for understanding ecological issues that they were not explicitly designed for. For example, an important dataset for understanding avian flu is the long-term datasets on bird migration.

The Countryside Survey was discussed in detail by one group as an example of a monitoring project that was set up to look at specific problems, which could be built upon to look at ecosystem services.

There was agreement that important services are those that hold significant relevance and/or resonance for society. A number of groups discussed if there were important services or processes that we are not currently monitoring. Suggested areas included

carbon sequestration and flux methane generation as they are relevant to climate change policy issues. One group suggested that greater monitoring was needed to understand changes to soil and marine biodiversity.

One group thought about what key indicators Defra could use for its natural environmental policy. It was suggested that Defra could follow the MA framework of supporting, provisioning, regulating, and cultural services as its key indicators.

Issues

The issues of cost and benefit need to be considered when looking at monitoring systems. There was concern about who was going to pay to collect data on ecological processes. Ideally, a greater focus on the benefits derived from ecosystem services would support increased funding for monitoring in this area.

As far as possible, monitoring should be relevant to people and decision-makers. Ecological processes take place at multiple scales, which will not always line up well with social or political boundaries. Special consideration needs to be given to how ecosystem service monitoring is relevant to different groups. This will be difficult and will require looking at ecosystem services over multiple scales.

The role of scientists in advising on the consequences of setting different targets or policy options was discussed. It was felt that for the most part scientists should focus on providing information on the potential risks and benefits of different options rather than advocating particular solutions. This would include helping to evaluate trade-offs between different ecosystem services. It was noted that in some instances, scientists would need to provide specific policy recommendations and they would need to be upfront about this when they are doing it.

The results of monitoring ecosystem services need to be communicated to the public so that they are aware of any changes. This will include helping people make informed decisions and understand tradeoffs regarding ecosystem services.

Interdisciplinary Research

Summary of presentation

Dr Paul Armsworth gave the introductory presentation on the challenges and opportunities of interdisciplinarity. He started by paraphrasing Jeffrey Sachs that no government or scientific institution in the world is properly organised to address the issues identified in the MA. He went on to look at how linking natural and social science is crucial to valuing ecosystem services, understanding how benefits are distributed across society and designing interventions.

He identified a number of obstacles to interdisciplinary research. First, it requires you to change the way you ask research questions. Second, it is important to pick your collaborators wisely. Third, there are fewer funding opportunities, journals to publish in, and specific career paths. However, the opportunities are such that ecosystem service research requires a degree of interdisciplinarity. Also, working in an interdisciplinary team offers a way forward for conservation and a path to new ecological questions.

Summary of breakout group discussions

Ecosystem service research needs multiple disciplines

All of the groups agreed that research on ecosystem services requires natural and social scientists to work together. Taking an ecosystem services based approach to research will require collaborative partnerships both to create the general framework for research and to do certain types of discrete pieces of work.

It was noted that the MA was an assessment designed by natural scientists and perhaps social scientists were not well engaged at the beginning and did not participate as fully as the ecologists did. Initiatives to develop the MA at the sub-global level should involve a good mixture of natural and social scientists from the start.

There was a general discussion about what constitutes interdisciplinary, multi-disciplinary and trans-disciplinary research. There was a feeling that greater clarity of the different terms was needed. It was felt that most research would be done by multi-disciplinary teams rather than by interdisciplinary researchers.

Challenges

With some notable exceptions, it was agreed that collaborative research that engaged both natural and social scientists was challenging. In large part this is due to the fact that science is divided by disciplines, which for all of its obvious benefits causes significant issues for collaborative research. In particular:

- There are very few journals that publish multi or inter-disciplinary work (exception: PNAS)
- There is limited funding from research councils (exceptions: RELU and some EU projects)
- Peer review for both funding and publishing is done on disciplinary lines. It was noted that multidisciplinary proposals often score lower.
- Language, terminology and methodologies differ across disciplines, making it hard to create collaborative research proposals.
- There are significant differences in the scientific methods, including data, employed by natural and social scientists.
- Career progression can be more difficult for people engaging in interdisciplinary research.

Solutions

People with experience of doing interdisciplinary research felt that it was exciting area to work in and can create new fields. It was agreed that more effort was needed in sharing experiences with those who have collaborated successfully. This would hopefully get more ecologists engaged in working collaboratively with economists and social scientists.

Some problems can only be answered through interdisciplinary research. Collaboration should focus on these sorts of research questions. It was recognized that problems that ecologists find interesting are not always the same issues that excite other disciplines, especially social scientists. It was suggested that identifying cross-disciplinary topics that are of interest to different groups would be a useful way of overcoming this obstacle. It was felt that ecologists could look at forging collaborative links with social scientists and economists who are already working on a specific ecological problem or in a particular place.

It was suggested that engaging 'pure' natural and social scientists in collaborative research projects would be beneficial, as a lot of inter/multi-disciplinary work was done by people at disciplinary boundaries. However, people felt that greater support for people working at disciplinary boundaries, like ecological economists, was also needed.

More opportunities for people from different disciplines to meet and work together were seen as way of encouraging multi-disciplinary work and improving understanding. Joint NERC/ESRC seminars were noted as an example of work in this area. One group felt that there was a need for facilitators to help bridge the disciplinary divides in multi-disciplinary teams. This would require support for creating "bridging" specialists.

There was discussion about building more opportunities to gain greater insight into other fields during degrees. This could include providing additional funding for secondary training in another discipline, greater freedom to select classes outside students' field, or possibly new qualifications.

Overall, it was felt that there needed to be new mechanisms to enable interdisciplinary research. This would need to include some additions to the current system of organising science, including funding, peer review, publishing and assessing scientific advancement.

Conclusion

Professors Mace and Raffaelli concluded the meeting by asking people what specific actions could be taken to bring this research and policy agenda forward.

The BES agreed to:

- Produce an Ecological Issues booklet on ecosystem services to highlight the importance of this area of work.
- Hold other meetings to engage the ecological community in this area of work.

Defra said it would engage the wider scientific community with its work in this area.

Other suggestions, included:

- Developing effective ways of communicating 'ecosystem services' to the public. Making it more accessible so that people understand and can engage with the key messages and concepts. This will require tailoring the message to different audiences.
- Identify case studies and areas that could be used to develop the ecosystem services framework on the ground (Contact Dr Dan Osborn: dano@ceh.ac.uk).
- Engaging younger ecologists to engage in the topic of ecosystem services through a CPB Graduate Student Workshop and other activities.
- Developing new places to publish research on ecosystem services.
- A meeting to examine how the MA could be brought into the Countryside Survey.
- Engaging with EU projects that look at ecosystem services (RUBICODE, ALARM and MarBef).
- Engaging businesses with this work so that they can better incorporate it into their operations. EarthWatch is working on this and would appreciate input.

Workshop Participants

Nick Dusic	BES
Chris Walker	BES
Dr Simon Jennings	CEFAS
Dr Allan Watts	CEH
Dr Peter Carey	CEH
Professor Jim Harris	Cranfield University
Dr Stephen Bass	Defra
Rebecca Anderson	Defra
Sarah Moon	Defra
Dr Peter Costigan	Defra
Prashant Vaze	Defra
David Calpin	Defra
Dr Andrew Stott	Defra
Dr Alison Holt	Diversitas
Pernille Risgaard	Earthwatch Institute
Dr Les Firbank	IGER
Professor Georgina Mace	Imperial College - CPB
Emily McKenzie	JNCC
Dr Richard Ferris	JNCC
Dr Dan Osborn	NERC
Dr Pamela Kempton	NERC
Dr Melanie Austen	Plymouth Marine Laboratory
Dr Jonathan Wentworth	POST
Rachel Gaulton	POST
Professor Alan Hildrew	Queen Mary
Rachel Garthwaite	Royal Society
Dr David Gibbons	RSPB
Dr Keisha Garcia	UNEP-WCMC
Dr Ana Rodrigues	University of Cambridge
Professor Malcolm Bennett	University of Liverpool
Professor Chris Frid	University of Liverpool
Katy Wilkinson	University of Newcastle
Dr Marion Potschin	University of Nottingham
Professor Roy Haines-Young	University of Nottingham
Dr Paul Armsworth	University of Sheffield
Dr Phil Warren	University of Sheffield
Professor David Raffaelli	University of York
Professor Phil Ineson	University of York
Professor Alastair Fitter	University of York