Scoping the potential benefits of undertaking a MA-style assessment for England

Full Technical Report

To

(Project Code NR0118)

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Notes:

This document reflects the views of the project team and not those of Defra and its partners.

If you use this document please quote as:

Haines-Young, R., Fish, R., Potschin, M., Brown, C.; Tindall, C. and S. Walmsley (2008): Scoping the potential benefits of undertaking an MA-style assessment for England. Full Technical Report to Defra (Project Code NR0118).

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Executive Summary

Background

The aim of this study is to identify and examine potential benefits of undertaking an ecosystem assessment for England. The need for such a study has arisen largely as a result of the 2005 Millennium Ecosystem Assessment (MA)[1], which not only demonstrated the importance of ecosystem services to human well-being, but also showed that at global scales, many key services are being degraded and lost.

The contribution that the MA has made globally was acknowledged by the House of Commons Environmental Audit Committee, which reviewed its relevance in the UK context (House of Commons Environmental Audit 2007a). They noted the slow uptake of the implications of the MA in the UK, and recommended that 'ultimately the Government should conduct a full MA-type assessment for the UK to enable the identification and development of effective policy responses to ecosystem service degradation' (para. 125).

However, the Committee took its evidence at the end of 2006, and clearly the situation may now be different. The motivation for this study is therefore to take stock of what has been achieved and test the case for MA-type assessment for England critically. The specific objectives of the study are to:

- Review the case for an MA-style assessment for England, given current evidence needs in relation to the delivery of healthy ecosystems and the sustainable supply of ecosystem services, and the extent to which these are met by existing research and monitoring programmes;
- Develop a framework for how an MA-style assessment could be undertaken in England and make best use of current monitoring and assessment processes in the UK; and
- Identify feasible options for undertaking an MA-style assessment for England, with an assessment of associated costs and benefits, and to make recommendations on how to take the planning and inception process forward.

Findings

An MA-style assessment for England which followed the framework of the 'global MA' would potentially, deliver a range of relevant evidence to the UK policy community, and address the needs set out in Defra's current *Action Plan for Embedding the Ecosystem Approach* (Defra, 2007a). However the case for undertaking an MA-style assessment for England depends on:

- The extent to which current and proposed research and monitoring initiatives already meet present and future needs for information about ecosystem services; and,
- There being no significant institutional or cost barriers to taking such an exercise forward.

Thus a detailed review of the adequacy of the developing evidence base was undertaken. We found that:

- Some ecosystems and ecosystem services are better researched than others. In particular, the terrestrial environment is generally better

[1] www.millenniumassessment.org

covered than the marine, but there is a general lack of information on the importance of biodiversity for securing ecosystem services.

- There are significant gaps in the information available on the state and trends in ecosystems and the output ecosystem goods and services, and the information on the linkages between ecosystems, ecosystem change and conceptions of human well-being is fragmented.
- The majority of existing national ecosystem assessment and monitoring programmes track changes in ecosystem health over time, in terms of ability of these systems to supply ecosystem services.
- The emerging evidence base on drivers of change has not yet been connect to an assessment of ecosystems services and where it is it is often at the wrong scale given the way decisions are made.
- There is little work on valuing ecosystem services and most existing approaches interpret valuation solely in economic terms.
- Tools for evaluating alternative futures exist, but current scenario exercises are weakly related to requirements of geography or scale.
- A case can be made for a more coordinated and coherent approach to assessing ecosystem services at national scales, and that the process of doing so could be seen as part of work to embed the ecosystems approach in decision-making more generally.

Recommendations

Different assessment options were compared in terms of their thematic scope and empirical detail. **Our review suggests that the most appropriate form for such an assessment is one that is broad in scope but initially limited in the range of new commissioned research and monitoring.** This approach proposed, would however, be highly integrated in tone - exploring connections between a wide variety of themes. The emphasis of the process would be on producing "headline messages" at the macro scale and on creating a compelling and coherent narrative at the national level, designed to recruit new partners to the exercise. We recommend such an option because if successful it could set in place new ways of thinking about ecosystem services, that would change the way people and organisations make decisions about them – thus embedding the Ecosystems Approach is a quite general way.

We recommend placing leadership of the national assessment within the Defra Chief Scientist Group, and supporting it by establishing a dedicated Scientific Secretariat. We estimate that the cost of such an exercise would be around £520k and the exercise would take about 2 years to complete; 2009 would be an appropriate starting point given the timetables of other studies likely to provide information for it. By using the exercise as a platform to review and refine understandings of evidence gaps, new research could be commissioned or encouraged via the Environmental Research Funders Forum or through the NERC-led Living with Environmental Change initiative. This would deepen the assessment approach in the long term and help embed the Ecosystems Approach in decision making more generally.

Our cost estimates do not cover the resources needed for a UK assessment. Although we strongly recommend that a UK study be done, the cost estimates presented here only cover that for England. It is assumed that the additional costs of the full national exercise would be met by the devolved administrations.

Acknowledgements

We are grateful to Defra's Natural Environment Strategic Unit (NESU)[2] group and especially Sarah Moon and later Robert Bradburne as NESU Project Manager for guiding us through the process in a very professional but also encouraging and calm way.

All parts of the report include inputs from the "Ma-style scoping workshop" held on 18th February 2008 in Cambridge. We would like to thank the all participants for their invaluable insights and discussion on our draft material.

We invited several people to become members of the project advisory board. While people seem to be generally very interested in this study, only a few did get back to us with some feedback. Time for this scoping was very limited, but we are optimistic that we could win more at a later stage for feedback. We are grateful for the input from the following Advisory Board Members:

- Ian Dickie (Eftec);
- Mark Everard (Environment Agency);
- Dave Raffaelli, University of York and UKPopNet Director; and
- Richard Bradbury (RSPB).

At the Seminars/Workshops, held by Defra in London during the first phase of the programme we received very many helpful comments and inspiration, including: David Calpin (Head of NESU, Defra) and Peter Costigan (Head of Natural Environment Science, Defra).

[2] http://www.defra.gov.uk/wildlife-countryside/natres/index.htm

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Part 1: Introduction

1.1 Background

The aim of this study is to identify and examine potential benefits of undertaking an ecosystem assessment for England.

The need for such a study has arisen largely as a result of the 2005 Millennium Ecosystem Assessment (MA)[3], which not only demonstrated the importance of ecosystem services to human well-being, but also showed that at global scales, many key services are being degraded and lost. It found that around 60% of the ecosystem services[4] evaluated were being used unsustainably, and that this had major implications for development, poverty alleviation, and the strategies needed by societies to cope with, and adapt to, long-term environmental change.

The MA was the first comprehensive global assessment of the consequences of ecosystem change for human well-being[5]. Its aim was to establish the scientific basis for the actions needed to enhance the conservation and sustainable use of ecosystems and to secure the contribution they make to people's livelihoods. It has resulted in the best available information and knowledge on ecosystem services being brought to bear on current and future policy and management decisions.

The MA was in part a global assessment, but to facilitate better decision-making at all scales, 34 regional, national and local assessments (or sub-global assessments [SGA]) were initiated. In all elements, human well-being was assumed to have multiple constituents, including the basic material for a good life, health, good social relations, security, and freedom of choice and action. The framework used for the MA interpreted people as integral parts of ecosystems and emphasised that a dynamic interaction exists between society and ecological systems. Although the MA emphasised the linkages between ecosystems and human well-being, it recognised that the actions people take that influence ecosystems result not just from concern about human well-being, but also from considerations of the intrinsic value of species and ecosystems.

The MA did not aim to generate new primary knowledge, but instead sought to add value to existing information by clarifying how ecosystems, human well-being and intrinsic values in nature are intimately connected. Indeed, one of the defining features of the process was that it collated, evaluated, summarized and interpreted information about these relationships in a clear, powerful and useable form. In particular, the MA applied the judgment of experts to existing knowledge to provide scientifically credible answers to policy-relevant questions. The focus on policy-relevant questions and the explicit use of expert judgment distinguishes the MA from a scientific review.

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[3] www.millenniumassessment.org

[4] Ecosystem Services are defined by the MA (2005) as "The benefits people obtain from ecosystems. These include *provisioning services* such as food and water; *regulating services* such as flood and disease control; *cultural services* such as spiritual, recreational, and cultural benefits; and *supporting services* such as nutrient cycling that maintain the conditions for life on Earth." Note that for convenience the term 'ecosystem services' is often used in this report to denote the longer 'ecosystem goods and services'. Ecosystem services are conceptually considered to include the output of goods.

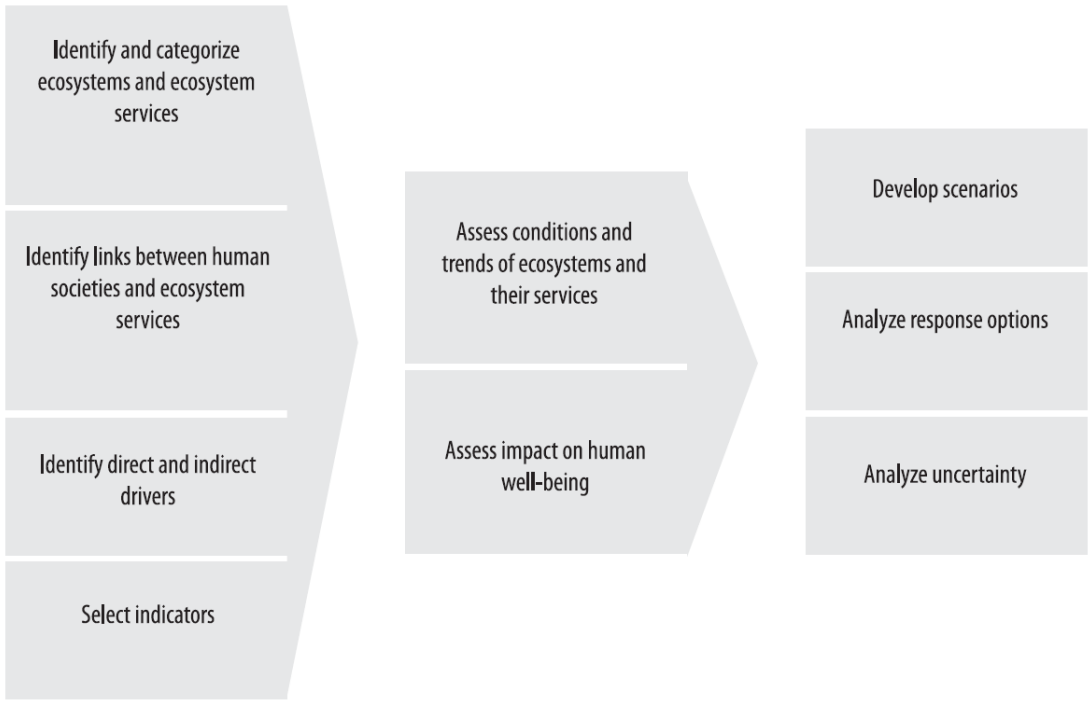
5 Human well-being is defined by the MA (2005) as "A context- and situation-dependent state, comprising basic material for a good life, freedom and choice, health and bodily well-being, good social relations, security, peace of mind, and spiritual experience."

The significant contribution that the MA has made globally was acknowledged by the House of Commons Environmental Audit Committee, which went on to review its relevance in the UK context (House of Commons Environmental Audit, 2007a). They noted the slow uptake of the implications of the MA in the UK, and recommended that 'ultimately the Government should conduct a full MA-type assessment for the UK to enable the identification and development of effective policy responses to ecosystem service degradation' (para. 125). In its response the Government noted the strong support amongst the UK research community for a full MA-type assessment for the UK, but argued that future initiatives must be carefully designed to avoid duplication (House of Commons Environmental Audit Committee, 2007b). The Government suggested that the way forward was to explore how a national assessment might pull together existing initiatives and ensure a more coherent approach to monitoring the status of and trends in ecosystem services, for both terrestrial and marine ecosystems, and predicting future impacts of drivers of change. **The aim of this study is therefore to examine potential benefits of undertaking an ecosystem assessment for England**.

1.2 Exploring the Case for an MA-Style Assessment

Despite the recommendation that, following the global MA, regional and national scale assessments should be made, there is no single, prescribed model setting out how such exercises should be undertaken. While methodological guidelines are in preparation[6], it is unlikely that they will be prescriptive, because the experience of

Figure 1.1: The Analytical Approach of the Millennium Ecosystem Assessment and its Main Tasks. Source: MA (2003)



[6] Ecosystem Assessment Manual, due to be released in October 2008

the global MA suggested that it was important for sub-global assessments to be tailored to meet 'local' needs. In consequence, some consideration of what the key elements of an MA-style 'Sub-global assessment' (SGA) for England might is an essential part of this study.

Although assessment approaches have to be flexible, clearly for any exercise to 'badge' itself as an 'MA-style assessment', it must conform in some respects to the structure of the global assessment. This model is depicted in Figure 1.1 below and serves as a convenient starting point for a review of what an MA-style assessment for England might involve.

The MA framework suggests that an assessment process follows a logical and sequential process of inquiry including: a **conceptualisation** stage, in which ecosystem services are categorised, drivers of change identified, links to human well-being elucidated, and indicators for monitoring change established; a **monitoring** stage in which the current state and trends of services are described and their implications for human well-being evaluated; a **scenario** stage, in which plausible future changes in ecosystems and their ecosystem services and the consequent changes in human well-being are assessed and an **evaluation** stage in which responses and measures to enhance well-being and conserve ecosystems are explored and key uncertainties hinder effective decision-makings addressed. This analytical approach provides the framework in which the case for an MA-style Assessment for England is examined in this report.

It should be noted that sub-global assessments under the follow-up programme to the MA, require a number of qualification criteria to be met[7]. If the UK Government would like to submit any future MA-like assessment as a contribution to the SGA framework, than the criteria will need to be considered. The criteria are:

1) The assessment must use the basic MA conceptual framework or a derivation of it;
2) The assessment must address the following ecosystem services and the consequences of change in ecosystems for human well-being, conditions and trends, scenarios and responses;
3) Specific process-related features are: user (stakeholder) engagement and local ownership, multi-sectoral and interdisciplinary scientific expertise, peer review, transparency, and reporting, data management and access and intellectual property rights; and,
4) Consideration also needs to be given to multiscale interactions, institutional capacity, funding, and monitoring and evaluation.

To translate the framework suggested in Figure 1.1 into some national or regional exercise, potential sponsors would have to consider the kinds of practical issue set out in Table 1.1. Before initiating any kind of assessment programme it would be important, for example, to understand what types of information it would produce and how useful such data would be to different types of user. Such information would inform design decisions relating to the scope and timing of the assessment, and how the exercise would be governed and funded.

The issues identified in Table 1.1 are partly derived from the experience described in designing the Portuguese sub-global assessment, which involved reviewing the information needs of a range of government and private organisations, and using these insights to plan how a national assessment could most effectively be

[7] Sub-global Assessments, follow-up to the Millennium Ecosystem Assessment policy document 2008

Table 1.1: Planning and making an ecosystem assessment

Exploratory stage	Is there a need for such an assessment?
	Defining its scope
	Which services, which systems?
	Identifying constraints
	Potential funding
Design stage	Determining user needs
	Governance
	Scales of assessment (e.g. national, regional and local)
	Appropriate analytical units
	Conceptual frameworks for the assessment
Implementation	Assessing conditions and trends
	Assessing direct and indirect drivers
	Developing scenarios
	Assessing responses
	Communicating results, capacity building and stakeholder engagement

accomplished (Pereira et al., 2003). Clearly this study is concerned mainly with the exploratory and design stages of the 'road-map' outlined in Table 1.1.

A considerable part of the work undertaken during this study has been directed towards understanding user needs. Given the way this Project was initiated, the starting point was Defra's recently published *Action Plan for Embedding an Ecosystems Approach* (Defra, 2007a), which outlined its key strategic goal of ensuring the delivery of healthy ecosystems and the sustainable supply of ecosystem services. In order to make our assessment of needs, we have considered the extent to which Defra's vision can be met by existing research and monitoring programmes, or whether that goal may be advanced by initiating a more formal MA-style process at national levels.

Although it has been important to retain a 'client focus' for this study, by virtue of its position it has been vital to look at Defra's needs in a broader context. Thus the evaluation of needs that we have made takes account of the global impact of the MA on science and policy agendas and its wider implications for the UK, together with domestic policy requirements.

1.3 Aim and Objectives

Since the Report of the Audit Committee and the publication of the Government's response, a number of studies dealing with different aspects of ecosystem services have been undertaken at the request of Defra. This report takes stock of what has been achieved, and examines the question of whether a formal MA-style assessment is needed to further inform Government policy and decision making in this important area of national and international concern. In looking at the case

for an MA-style assessment for England, this document also considers the issue from a more practical perspective. It considers how such an assessment might be undertaken if one was required, and what costs such an exercise might entail. In particular, the specific objectives of the study are to:

- review the case for an 'MA-style assessment for England', given current evidence needs in relation to the delivery of healthy ecosystems and the sustainable supply of ecosystem services, and the extent to which these are met by existing research and monitoring programmes;
- develop a framework for how an MA-style assessment could be undertaken in England and make best use of current monitoring and assessment processes in the UK; and
- identify feasible options for undertaking an MA-style assessment for England, with an assessment of associated costs and benefits, and to make recommendations on how to take the planning and inception process forward.

A considerable part of the work undertaken to meet these objectives has been directed towards understanding user needs. Given the way this Project was initiated, the starting point was Defra's recently published *Action Plan for Embedding an Ecosystems Approach* (Defra, 2007a)[8], which outlined its key strategic goal of ensuring the delivery of healthy ecosystems and the sustainable supply of ecosystem services. In order to make our assessment of needs, we have considered the extent to which Defra's vision can be met by existing research and monitoring programmes, or whether that goal may be advanced by initiating a more formal MA-style process at the national level. Although it has been important to retain a 'client focus' for this study, by virtue of its position it has been vital to look at Defra's needs in a broader context. As a result, the evaluation of needs that we have made takes account of the global impact of the MA on science and policy agendas and its wider implications for the UK, together with domestic policy requirements.

1.4 Structure of the Report

The report is divided into four further sections, In Part 2 of the report we consider the policy context in which an MA-style assessment for England would be set, and the ways in which Defra's involvement or leadership would assist the UK in meeting both its wider international commitments and the goals set by national policy. Part 3 then goes on to explore the extent to which the current and planned research portfolio of Defra and its partners has already, or is likely to, put in place all the elements of a national ecosystem assessment. A key question that is explored in this part of the report is the extent to which current or planned work amounts to a '*de facto* MA', with the implication that further investment of time and effort in a formal exercise would be redundant. Here our goal is to determine whether there are significant gaps in the current or evolving evidence base that could usefully be overcome by an MA-style assessment, and what kinds of timetable for such an assessment might be appropriate.

[8] The Defra Action Plan uses the term 'Ecosystem**s** Approach' using the plural to emphasise that no prescriptive methodology is implied. In this report we employ the more widely used 'Ecosystem Approach', as described in the CBD, which emphasises the higher-level or more strategic issues surrounding decision making - but broadly the two are synonymous; see Haines-Young and Potschin (2008).

Although the brief for this study asked us to consider the specific requirements of Defra, it is clear that the success of much of its work depends on partnerships with a range of other organisations. Thus it is necessary to expand the remit of this investigation to cover the activities in Defra's Agencies (e.g. Natural England, Environment Agency), other government departments, and NGOs and research organisations active in the environmental sector. In considering this wider circle of interests, our aim is not so much to assess the broader set of needs that exist at the national level, but rather to take stock of the activities in these partner organisations that may inform Defra's judgment about its need for a MA-style assessment for England.

Our work has, however, focused specifically on the English rather than the UK context. While there may be merit in coordinating activities across the devolved administrations, the question of whether an MA-style assessment is needed for the UK as a whole can only be answered, perhaps, once the potential partners in such an exercise have looked at their own requirements and responsibilities. We see the outputs of this study as one of the elements in the wider national debate that may need to be had.

Having reviewed the requirements for an MA-style assessment for England, Part 4 of the report looks at the options open to Defra. We compare the benefits and costs of the 'do nothing' option with others that more formally stimulate and coordinate assessments of ecosystem services at different levels of thematic and geographic detail. On the basis of the findings presented in Parts 2, 3 and 4, the final section of the report (Part 5) makes recommendations on how Defra's requirement for evidence on the state and trends of England's ecosystem services are sustained might best be met.

Part 2: Policy Context for an MA-style Assessment for England

Key Messages

An MA-style assessment for England which followed the framework of the 'global MA' would potentially:

- *deliver a range of relevant evidence to the UK policy community; and,*
- *address the needs set out in Defra's current Action Plan for Embedding the Ecosystem Approach.*

However the case for undertaking an MA-style assessment for England depends on:

- *the extent to which current and proposed research and monitoring initiatives already meet present and future needs for information about ecosystem services; and,*
- *there being no significant institutional or cost barriers to taking such an exercise forward.*

Thus, a detailed review of the adequacy of the developing evidence base is required, alongside a review of the practical issues that might impact on such an undertaking.

2.1 Introduction

This part of the Report considers the policy context in which an MA-style assessment for England would be set and the ways in which Defra's involvement or leadership would assist the UK in meeting both its wider policy goals and international commitments. We therefore consider international developments from an English perspective and then go on to look at the relevance of the MA conceptual framework in relation to domestic issues. In both cases, our aim is to examine the extent to which the requirement of emerging national and international policy frameworks might be best served by an MA-style assessment for England.

2.2 International Policy Frameworks

2.2.1 Global Perspectives

As the interim review of the MA suggested (Reid, 2006), and subsequent developments have confirmed, the findings of the MA have had a significant impact on the international biodiversity conventions, namely, the Convention on Biological Diversity (through Decision VIII/9) and the Ramsar Convention on Wetlands of Importance. Conference of the Parties (COP) to both of these conventions have endorsed decisions and recommendations based on the materials and information of the MA. There has also been a growing impact on the UN Convention to Combat Desertification.

The UK is a signatory to, and has ratified all three of, these conventions. **One of the policy-benefits for undertaking an MA-style assessment for England would be**

its contribution to the UK Government's implementation of the decisions under these conventions. Most notably:

- CBD Decision VIII/9, paragraph 23, which calls for parties to conduct assessments making use of the conceptual framework and methodologies of the MA; and,
- Ramsar Resolution IX.1, Annex A, which updates the 'wise use' concept to include the MA framework and ecosystem services.

Furthermore a recommendation was drafted by the 12th meeting of the Subsidiary Body on Scientific, Technical and Technological Advice (SBSTTA-12), for consideration at the next COP[9] for the CBD in May 2008, for Parties to make full use of the framework, experiences and findings of the MA when they review, revise and implement their national biodiversity strategy and action plans, relevant development plans, and development cooperation strategies, as appropriate.

Thus whether or not a formal MA-style assessment for England were to be undertaken, some way of demonstrating what has or is being done in the UK will be essential. It would also strengthen the UK's contribution to the International Mechanism of Scientific Expertise on Biodiversity (**IMoSEB)** process. If adopted IMoSEB will provide an opportunity for decision makers and experts from around the world to come together to consider the best ways of linking knowledge and action in relation to sustaining the planet's natural wealth and supporting human well-being and development.

The particular impacts that the global MA has had on these important international conventions is also reflected in wider, international policy frameworks. For example, the World Summit on Sustainable Development (United Nations Department of Economic and Social Affairs, 2002) also sets a target for encouraging the application of the ecosystems approach by 2010, and in particular, noted the Reykjavik Declaration on Responsible Fisheries in the Marine Ecosystem and the link to the Convention on Biological Diversity. A recent but further important component of the international framework, in which an England MA-style assessment would be set, is provided by recommendations of the 13th meeting of the Parties to the United Nations Framework Convention on Climate Change (UNFCCC)[10]. While their conclusions do not explicitly mention the MA, the decision on reducing emissions by controlling deforestation, implicitly recognises that there are important non-timber services associated with forests.

2.2.2 European Perspectives

The findings and concepts of the MA have also been taken up by the European Commission. The Communication of the Commission of the European Communities on halting biodiversity loss by 2010 and beyond (Com (2006) 216 final) emphasises the importance of biodiversity for ecosystem services, which ensure human well-being. Specially, within its action plan the following objectives are critical:

- **Objective 2 -** To conserve and restore biodiversity and ecosystem services in the wider EU countryside;
- **Objective 6 -** To substantially strengthen effectiveness of international governance for biodiversity and ecosystem services; and,

[9] Provisional agenda
[10] http://unfccc.int/2860.php

- **Objective 8 -** To substantially reduce the impact of international trade on global biodiversity and ecosystem services.

Streamlining European Biodiversity Indicators 2010 (SEBI2010) is a pan-European initiative that was launched in 2004. Its aim is to develop a European set of biodiversity indicators to assess and inform progress towards the European 2010 targets. The work is a collaboration between the European Environment Agency (EEA), DG Environment of the European Commission, the European Centre for Nature Conservation (ECNC), and UNEP/PEBLDS Secretariat with the lead of the Czech Republic and UNEP World Conservation Monitoring Centre. In 2005 SEBI2010 Coordination Team and six Expert groups involving more than 100 experts nominated by European countries as well as non-governmental organisations started compiling the First European Set of Biodiversity Indicators for assessing the 2010 targets. To date, 19 biodiversity indicators have been developed, though none as yet specifically address the importance or role of ecosystem services.

In the marine sector there are a number of additional, specific initiatives that are relevant to questions of the need for information about ecosystem services. The International Council for Exploration of the Sea (ICES), for example, defines and promotes the Ecosystem Approach[11] as the integrated management of human activities based on knowledge of ecosystem dynamics to achieve sustainable use of ecosystem goods and services, and maintenance of ecosystem integrity. Furthermore, the Bergen Declaration at the 5th International Conference on the Protection of the North Sea, 2002, commits signatories to use the Ecosystem Approach within management of the North Sea.

The proposed EU Marine Strategy Directive indicates that all human activities affecting the marine environment should be managed in an integrated manner that promotes conservation and sustainable use of oceans and seas in an equitable way. European Marine Regions will be established on the basis of geographical and environmental criteria and Member States will develop Marine Strategies for the regions. Where these encompass waters' of several Member States and third countries, they will work in close cooperation. The Marine Strategies will contain a detailed assessment of the state of the environment, a definition of 'good environmental status' and establishment of environmental targets and monitoring programmes. Impact assessments and cost-benefit analysis of proposed measures will also be required. Clearly evidence about the state and trends of ecosystem services and the impacts of society will be fundamental.

The EU Water Framework Directive (Directive 2000/60/EC) establishes a framework for all member states to achieve good chemical and ecological status in their groundwater and surface water bodies by 2015. All impacts on the ecological, quantitative and qualitative functions of water have to be analysed within the context of river basin management plans, processes that may be enhanced through exercises in ecosystem assessment at the national or sub-national scale. Moreover, as an approach to water management and monitoring the WFD is highly analogous with the ecosystems approach more generally, not least the directive emphasises that water policy must be shaped by more participatory and community based structures of decision making.

[11] In this report we try to avoid abbreviating the term 'Ecosystem Approach'. The often used abbreviation 'EA' conflicts with the EA used in the UK for Environment Agency and others. The IUCN CEM suggests to use EAs as an abbreviation.

Once again, whether or not a formal MA-style assessment for England is undertaken, the UK Government must ensure that national monitoring and reporting processes deliver information that demonstrates how the UK is meeting the requirements of these various agreements and conventions, either in relation to the general area of embedding an Ecosystems Approach or in the assessment and management of ecosystem services.

Since it is difficult to think of an Ecosystems Approach that does not involve the need to assess the state and trends of ecosystem services the questions of how best to embed it in decision making and whether an MA-style assessment is needed are inextricably linked (Haines-Young and Potschin, 2008). While it does not follow that a national MA-type exercise is required, the conclusion that some mechanism for coordinating work on ecosystem services may be needed is difficult to avoid. The case for developing some kind of national overview is highlighted by the fact that the UK will have to consider its position in relation to the possibility of a European-scale MA being currently being developed.

Proposals for a European-scale assessment, currently called '*EURECA 2012'* are still at the definition stage[12]. The scoping study is being led by the EEA, and it is envisaged that the assessment will be one of the sub-global assessments under the MA follow up programme. It is currently envisaged that *EURECA 2012* will report on the state and trends of ecosystem services across Europe for 2012, and will also be connected to or draw on a range of national MAs in Europe. Since the publication of the MA, the Ministry of Ecology and Environment in France has decided that it will undertake a national Millennium Ecosystem Assessment (Levrel, 2007). Norway has already recently published a pilot assessment (The Directorate for Natural Management, 2002) and Germany has conducted a feasibility study for a national-scale follow-up (Beck et al., 2006). **Clearly it would be essential that any future work in England should be linked to such an initiative at the European level, and aligned to equivalent assessments so that the national situation can be represented accurately and the implications of domestic trends can be seen in a wider and comparative context.** Whether this work is presented through the vehicle of a formal MA-style assessment for England is a question that needs to be examined further in this study.

2.2.3 Conclusions in Relation to International Policy Needs

A recent meeting - 'Millennium Ecosystem Assessment: What's next?' was held in Stockholm, Sweden in October 2007[13]. The objective of the meeting was to discuss the impacts of the MA and whether there would be any benefit for a second MA-like assessment to be completed. The meeting concluded that, while the first MA (a global with some sub-global assessments at different scales) was effective, any future MA should be drawn from a larger set of sub-global assessments to present a global picture. If an MA-style assessment were undertaken for England (or the UK) it would clearly be able to contribute to the second global exercise, and in return the UK government would be provided with the opportunity of seeing where England fits within the global picture of trends and status of ecosystem services.

[12] www.eea.europe.eu or http://biodiversity-chm.eea.europe.eu/information/F1051869800/fol818985/

[13] MA Follow-up Programme (2007): Millennium Ecosystem Assessment: What next? Report from: "The Millennium Ecosystem Assessment Follow-up workshop", October 22-23 2007, Ministry for the Environment Stockholm, Sweden; and http://www.icsu-africa.org/mea_wsrep_2007.pdf

Whether England, or the UK as a whole, initiates a formal MA-style process, it is clear that increasingly international policy will be framed around notions of the Ecosystems Approach and the wise use of ecosystem services. If we are to participate in, and contribute effectively to, such debates, then some coordinating mechanism will be required to marshal evidence relevant to national interests and present it in a way that has currency in the international arena. **On the international stage it is clear that even as a presentation tool, the publication of a 'national MA', albeit one based on existing research and monitoring, would have immediate purpose and relevance.**

2.3 National Policy Frameworks

2.3.1 Biodiversity Strategies

Arguments about the need to sustain ecosystem services bring a new, utilitarian dimension to debates about how best to conserve biodiversity. The need to conserve biodiversity is no longer argued only in terms of its intrinsic value, but in terms of the benefits ecological systems provide to people. As national biodiversity strategies evolve, therefore, it is likely that we will see much broader sets of arguments deployed, and much wider sets of evidence will be required as the basis for framing policy.

As an earlier study commissioned by Defra, on the state and trends of ecosystem services in England argued (see Haines-Young and Potschin, 2008), while the Biodiversity Action Plan (BAP) framework[14] has been a significant policy instrument, both the species and habitat action plans themselves, and more importantly the revised action plan targets that have recently been published, make little explicit reference to the importance of conservation or restoration measures for the outputs of ecosystem services. Indeed the review (see Haines-Young and Potschin, 2008, p. 23) found that systematic and detailed evidence linking BAP species and the quantity and quality of BAP habitats to the output of ecosystem services was not available.

2.3.2 The Defra Ecosystems Approach Action Plan

A valuable starting point for investigating the national setting for a potential MA-style assessment is Defra's recently published *Action Plan* (Defra, 2007a), which elaborates its broad strategic goals for the natural environment within an Ecosystems Approach. However it is also worth pointing out that the Action Plan does not deal with the marine environment in depth and it is therefore also necessary to look at specific marine policies to assess how an MA-style assessment may support the implementation of these (see Section 2.3.5 below).

The *Action Plan* has two key themes:

- The new, cross-Government Public Service Agreement (PSA) which aims to secure 'a diverse, healthy and resilient natural environment' (Table 2.1). The Action Plan stresses the vital contribution that an 'Ecosystems Approach' to decision making will play in achieving it; and,
- The importance of understanding the state and trends of our terrestrial and marine ecosystem services, how we value them and how we manage these resource systems for people within the limits of ecosystem functioning.

[14] www.ukbap.org.uk/ and www.defra.gov.uk/wildlife-countryside/biodiversity/ukbap/index.htm

Table 2.1: The New Cross-Government Public Service Agreement (after Defra, 2007a)

The Public Service Agreement sets out Government's vision for the natural environment:

> *To secure a diverse, healthy and resilient natural environment, which provides the basis for everyone's well-being, health and prosperity now and in the future; and where the value of the services provided by the natural environment are reflected in decision-making.*

This vision will be achieved by ensuring:

- The air that we breathe is free from harmful levels of pollutants;
- Sustainable water use, which balances water quality, environment, supply and demand;
- Land and soils are managed sustainably;
- Biodiversity is valued, safeguarded and enhanced;
- Sustainable, living landscapes with best features are conserved;
- Clean, healthy, safe, productive and biologically diverse oceans and seas; and
- People enjoy, understand and care for the natural environment.

The two themes are closely connected in that they require a holistic approach to policy development and appraisal that links concerns for the biophysical aspects of natural resource systems to its consequences for human well-being. Echoing international policy frameworks, the *Action Plan* goes on to describe the importance of embedding the Ecosystems Approach in decision making at all levels, and across different policy domains, so as to escape the problems created by thinking in 'silos'. As a result it is argued that the policy process will:

- More effectively deliver environmental outcomes;
- Enable decisions that take full account of the natural environment;
- Ensure better prioritisation of issues and use of natural resources; and
- Promote greater awareness of the importance of ecosystem services and the value of the natural environment.

The document lists 34 actions designed to build awareness of the Ecosystems Approach and the importance of ecosystem services, and to ensure that the concepts are used widely in decision-making. These actions offer insight into Defra's immediate information needs and the links with other organisations that are seen as being of direct importance in taking its vision forward.

The table in Appendix 1 regroups and reviews the actions identified in the *Action Plan*. As a first step they were cross-tabulated against the nine different conceptual elements of the 'model MA'. Comments have then been added to identify how particular elements of a national assessment exercise might potentially support each of them. Clearly many of the elements of the model-MA are dependent on each other and so the separation between them in the table is mainly one of emphasis. Nevertheless, despite this approximation, the information needs identified by grouping the actions in this way show that Defra has a very broad range of requirements that might be served by some kind of national MA-type exercise.

All of the actions identified in the *Plan* can in some way be supported by a potential MA-style assessment for England. These requirements include the need to:

- Conceptualise and communicate its thinking about ecosystem services in a national context (Actions in Block A, Appendix 1, p. 71);
- Identify case studies that demonstrate the importance of managing ecosystem services in sustainable ways so that their importance can be appreciated by others (Block B and C);
- Understand the direct and indirect drivers of change affecting ecosystem services and human well-being through scenarios and modelling (Block D);
- Understand how information about ecosystem services can be used to design policy relevant indicators (Block E);
- Have access to robust and timely information on the state and trends of ecosystem services (Block F);
- Understand the values that can be attached to ecosystem services and how they vary from place to place and change as a result of the impact of direct and indirect drivers upon them (Block G);
- Understand and promote new institutional arrangements that would achieve the integrated or holistic management of ecosystem services required by the ecosystems approach (Block H); and,
- Contribute to the design and promotion of policy relevant research, and to gain access to the best science to support its decision making (Block I).

Thus an MA-type exercise could potentially make an important contribution to both the evidence base upon which Defra draws, and the activities it seeks to promote that are consistent with the sustainable management of environmental resources.

2.3.3 Biodiversity Strategy for England

Defra published in 2002 *Working with the grain of nature: A biodiversity strategy for England*[15]. This *Strategy* brings together activities within England designed to achieve:

- The 2010 Target[16];
- Integration of biodiversity into our mainstream thinking; and,
- Healthy, thriving and diverse ecosystems that are essential to everybody's quality of life and well-being.

The *Strategy* is, in fact, based on the premise that healthy functioning ecosystems provide benefits to people, some which are obvious such as tourism or countryside services but also the ecosystem services, which are also not apparent, and not reflected in market prices. The *Strategy* also recognises that there is a growing benefit of protecting and enhancing biodiversity and ecosystems for improving both physical and mental well-being. However, if these benefits are to be realised then there is a need to improve techniques for the valuation of biodiversity by society and decision-makers.

One way forward to implement such a strategy is through the ecosystem approach, such as through the pilot study in the Irish Sea (2002-2003), which attempted to determine the limits of existing systems and how to integrate

[15] http://www.defra.gov.uk/wildlife-countryside/biodiversity/biostrat/

[16] The 2010 target aims –' *to achieve a significant reduction of the current rate of biodiversity loss at the global, regional and national level as a contribution to poverty alleviation and to the benefit of all life on earth by 2010'.*

biodiversity into key marine sectors as an effective contribution to sustainable development.

The *Strategy* also recognises for successful implementation, the correct use and interpretation of biodiversity information does require a good scientific understanding of the ecosystem dynamics and the impacts on humans.

Adapting to climate change is also dealt within the strategy. The objectives within the strategy look to take into account the likelihood of significant climate change in 20 and 50 years time by promoting policies which regard biodiversity as a component of a larger ecosystem, operating across whole landscapes or seascapes to ensure that ecosystems are maintained for human well-being.

In 2006 Defra published a progress report on the implementation of the *Strategy*[17]. During this review of the implementation a revised vision was adopted, 'Our vision is for a country – its landscapes and water bodies, coasts and seas, towns and cites – where living things and their habitats are part of healthy functioning ecosystems, where we value our natural environment, where biodiversity is embedded'. The review of the strategy also took into consideration Decision VII/30 of the Conference of the Parties to the Convention on Biological Diversity (March 2006). While this decision does not specifically direct Parties to the implementation of the MA framework but encourages all Parties to integrate biodiversity considerations into all relevant national policies, programmes and plans in response to climate change, taking into account the maintenance and restoration of the resilience of ecosystems which are essential for sustaining the delivery of their goods and services. This is being achieved in part through the establishment of the Climate Change Adaptation work stream within the strategy.

The review also took into consideration the need for an integrated policy framework based on the conservation and enhancement of whole ecosystems. It was stated that this was a long term agenda that would require the further developing and applying of expertise on environmental limits and valuation.

An MA-style assessment for England could also be used a vehicle to implement this strategy by linking together information to provide a better understanding of biodiversity data and information, identify policies which address biodiversity within the larger ecosystem and provide possible scenarios for land use change and climate change for different time intervals.

2.3.4 UK Biodiversity Indicator Framework

The UK have established a suite of eighteen indicators, grouped under six focal areas based on a framework agreed by the CBD and the European Council. These indicators measure not only progress towards the 21010 Target made by the UK but also the implementation of the strategies and frameworks in existence in the UK. One focal area is Ecosystem integrity and ecosystem goods and services. An MA-like assessment for England could take advantage of these indicators as well as enhancing the ecosystem based indicators, such as the indicator for extent of ecosystems and provide other measures for ecosystem services.

2.3.5 National Marine Policy Frameworks

[17] Defra (2006) Working with the grain of nature – taking it forward (Progress Report on England Biodiversity Strategy www.defra.gov.uk/wildlife-countryside/biodiversity/biostrat/indicators/pdf/grain/grainvol1v3.pdf

The *Action Plan for Embedding an Ecosystems Approach* (Defra, 2007a) sets two main actions that are relevant to the marine environment, namely supporting the new system of marine planning through the Marine Bill, and assessing the state of our seas by 2010. However since the Plan does not give the full context of the national policy framework for the marine environment. We offer an overview of how an MA may assist Defra in delivering on these policy commitments (Table 2.2).

Defra's *Safeguarding Our Seas* Strategy of 2002 set out a 'shared vision' for clean, healthy, safe, productive and biological diverse oceans and seas, and commits the UK to implementing an ecosystems approach. As part of Defra's Ecosystems Approach to management, the *Strategy* recognises the importance of *integrated*

Table 2.2: Summary of potential contribution of an MA-style assessment to the national marine policy framework

Marine Policy Framework & developments		**Potential support offered by MA**	**MA Element**
Safeguarding Our Seas Strategy 2002		Assists in delivering ecosystem approach Assists delivery of integrated assessments to support policy-making 'Enhances' reporting within the Charting Progress Reports	1,2,3,4, 5,6,7, 8,9
Marine Policy Statement		Supports priority setting by providing information on current status and future trends	7, 8
Headline Marine Objectives			
Marine Bill	Marine planning	Assist in comparing different policy, planning or conservation options and reconciling environmental, economic and social costs and benefits.	6, 8
	Marine Conservation Zones	Provide information on the location and scale of important goods and services and approaches to compare costs and benefits of zoning.	
	Licensing activities	Assists in distribution on licenses based on a baseline understanding of ecosystem services available	8
	Marine Management Organisation	Provision of a framework for the MMO to coordinate data collection (monitoring), & assessment and linking this to decision-making Assist planning & development of response options	6 8
	Marine Fisheries Management	Assist in measuring progress on delivering long-term economic benefits	1,2,3,6
Sustainable vision for fisheries 2027			3, 5, 6, 8

Potential MA elements: (1) Identifying and categorising ecosystems and ecosystem services; (2) Identifying links between human societies and ecosystem services; (3) Identifying direct and indirect drivers; (4) Selecting indicators; (5) Assessing conditions and trends of ecosystems and their services; (6) Assessing impacts on human well-being; (7) Developing scenarios; (8) Analysing response options; (9) Analysing uncertainty.

assessments based on the environment, marine resources and socio-economics to enable a planned use of resources. The strategy encourages decision making based on 'sound scientific evidence' on the quality, structure and functioning of the marine environment and is based on maximising long-term economic benefits. Currently, the strategy is reported on within an assessment report called 'Charting Progress (CP)' delivered in 2005 and due again (CP II) in 2010. However, reviewing the commitments in the strategy and the aspects that an MA-style assessment would deliver, it is clear that such an assessment would enhance a progress report by providing status and trends on marine ecosystem services (rather than ecosystem components) and their likely values.

Defra has recently been working on developing a Marine Policy Statement that will define headline marine objectives. An MA-style assessment could provide support on defining objectives and priorities for the future through the use of scenarios, although the processes are not aligned as headline objectives are to be set this year. An MA-style assessment would also provide information to assist in measuring progress against the objectives, but the extent of this will depend on how these objectives are defined.

A White Paper (Defra, 2007d) was launched in March 2007 for a Marine Bill, which will help Defra deliver the Government's vision of 'clean, healthy, safe, productive and biologically diverse oceans and seas' and responsibilities under the EU Marine Strategy Directive. The 'Marine Bill' aims to put in place a better system for delivering sustainable development of the marine and coastal environment, addressing both the use and protection of marine resources. Five key issues are covered: planning in the marine area; licensing activities and developments in the marine area; marine nature conservation; modernising marine fisheries management (in England, Wales and Northern Ireland); and a new Marine Management Organisation (MMO). The marine bill also allows for the development of Marine Conservation Zones (MCZs). A national MA-type assessment could contribute towards decision-making in the marine planning system and allocation of MCZs by providing information on ecosystem services that takes into account social and economic values rather than only 'eco-centric' information on habitats and species.

Defra also has a vision for sustainable fisheries for 2027 which contributes to '*Safeguarding our Seas*'. The vision is based on maximising long-term economic benefits and therefore the valuation of goods and services approach of the MA-style assessment would be in line with this. Indeed, fisheries are one of the marine sectors that have been most extensively valued in terms of economic and social benefits to society (e.g. employment, value of production etc). The vision also specifies that fishing should be managed according to an Ecosystem Approach, including the use of the precautionary principle. An MA-style assessment could benefit this by bringing together information on the current state of the wider marine environment and the impact that fishing is having, as well as projected future scenarios to enable management to plan for the future, particularly in the face of climate change which may alter the abundance and distribution of fish stocks in EU waters.

Despite the potential for an MA-style assessment to assist delivery of marine policy, a key constraint would be an England-only focus. Restricting an MA-style assessment to England would mean dividing marine areas and would in effect divide up different ecosystems (and therefore nullify an 'Ecosystem Approach'. For example the Northern North Sea zone would fit into both an England and Scotland assessment, and it would be difficult to determine what aspects of the

Irish Sea and North Channel should be included within an English, as opposed to a Welsh, assessment. Added to this for the marine environment, is the complexity of different reporting obligations at different scales (national, sub-regional, regional and international) and the over-lapping jurisdictions of different institutions (e.g. the European Environment Agency is responsible for certain elements up to 6 nautical miles (nm), the Crown Estate owns the sea bed from the high-water mark to 12nm, Natural England provides advice from areas inland to 12 nm and different government departments take different responsibilities from 12 to 200nm. Some of this complexity will be addressed in the Marine Bill.

2.3.6 Local and Regional issues

An assessment of the state and trends of ecosystem services is not yet an explicit feature of regional and local policy frameworks, though it is clear that such a process could be consistent with the needs of strategy at these scales. Regional assemblies, which are responsible for the design and implementation of Regional Spatial Strategies, could be assisted in realising expectations for these spatial visions and indeed may provide an evidence base in which models of national ecosystem assessment can be informed. More specifically, Ecosystem assessment may assist statutory, multi-agency processes, such Local Strategic Partnerships in fostering progress towards "sustainable communities" and in particular, meeting the mandatory outcomes of Local Area Agreements.

2.4 Potential Users of an MA-style Assessment

2.4.1 In-house 'Defra users'

The *Action Plan for Embedding an Ecosystem Approach* notes 'owners' against each of the actions. If we make the assumption at this preliminary stage that an MA-style assessment for England would contribute to the actions in the way envisaged, then these data can also be used to identify some of the main customers for such an exercise, both within Defra and outside it. Tables 2.4 summarises the results of this analysis.

As might be expected given the context of the *Action Plan,* the most widespread interests were internal (Table 2.3). Defra's Wildlife and Countryside Directorate, and the Chief Economist Group were linked to the largest number of actions:

- The Wildlife and Countryside Directorate is made up of a number of groups covering environment and biodiversity issues relating to marine and terrestrial ecosystems. Within it the International Biodiversity Policy Unit has a mandate to respond to biodiversity issues through the CBD and any international follow-up activities related to the MA. As Table 2.3 shows their interests were spread across most of the potential information outputs from an MA-type exercise.
- Evidence of the potential importance of ecosystem assessments to the Chief Economist group is provided by the recent publication of a set of guidelines for the valuation of ecosystem services (Defra, 2007b), and case studies that explore the role of valuation tools in policy appraisal (Defra, 2007e). However, while their interests focused on cost and benefit issues, their work clearly depends upon more basic assessment information being available.

Although the Marine and Fisheries Directorate does not have a large number of associated actions in the *Action Plan for Embedding an Ecosystem Approach,* it is

likely to be a major user of an MA-style assessment. There are also other government departments or authorities that are relevant including the Ports Authority and the Marine Management Organisation (when created). The low appearance of this Directorate in the Action Plan raises an issue of coordination on marine issues since the ecosystem approach is inherent within all the main marine policies. An MA-style assessment may be able to assist greater integration of marine and terrestrial policies and assessments.

Further to this, the Directorate for Climate Change would have an interest in the status and trends of both terrestrial and marine goods and services indicators, if it assisted prediction of the impacts of climate change and the evaluation of potential adaptation measures. Similarly, the Strategy and Sustainable Development Group, within the Science Directorate would also have an interest in monitoring the status and trends of goods and services in order to underpin their work.

2.4.2 Users outside of Defra

The analysis presented in Table 2.3 suggests that the requirement for the types of information that might be provided by an MA-style assessment for England extend beyond Defra's immediate needs. After the top two internal Defra Directorates, the next four most frequently linked interests were outside organisations, namely the Executive Director for Strategy and Performance in Natural England, the Director of the Forestry Commission England, the Head of Wildlife, Recreation and Marine at the Environment Agency, and the Deputy Director, for Science and Innovation in Natural Environment Research Council (NERC). Their interests span a range of the components of a potential MA-style assessment (Table 2.3).

Table 2.3: Immediate Customers for an MA-style Assessment for England– number of relevant actions assigned to each in the *Action Plan* (Defra, 2007a)

'Action Owner' and Potential Customer for an 'MA-style assessment for England'	Number of Actions	MA Elements								
		1	2	3	4	5	6	7	8	9
Director, Wildlife and Countryside, Defra	12	3	3	1	2	4	3		12	1
Chief Economist, Defra	6				1	1	4		6	3
Executive Director, Strategy and Performance, Natural England	6				1	3	3		6	1
Director, Forestry Commission England	5				1	2	2		5	1
Head of Wildlife, Recreation and Marine, Environment Agency	5				1	2	2		5	1
Deputy Director, Science and Innovation, NERC	4	1	1			1	1	1	4	
Director, Head of Science Directorate, Defra	4					1			4	
Director of Water, Defra	3	1	1						3	
Director, Marine and Fisheries, Defra	3					2	1		3	
Chair, ERFF	2								2	
Deputy Regional Director, Environment, Resilience & Rural, GONW	2				1	1			2	
Director, Rural Landscape and Adaptation, Defra	2	1	1			1	1		1	
Associate Director for Research (Environment, Education and Governance), ESRC	1								1	
Associate Director for Research (International Relations and Development), ESRC	1	1	1			1	1		1	
Director of Communications, Defra	1								1	
Director of New Homes and Sustainable Development, CLG	1					1			1	
Director, International Climate, Air and Analysis, Defra	1	1	1						1	
Director, Policy and Research, DFID	1	1	1			1	1		1	
Director, Rural Landscape and Performance, Natural England	1								1	
Director, Sustainable Consumption and Production and Waste, Defra	1								1	
Director, Sustainable Development and Regulation Directorate, BERR	1	1	1		1	1			1	
Director, Transport Analysis and Economics, DfT	1	1	1		1	1			1	
Head of Programmes, Forestry Commission	1					1			1	
Director, Strategy and Sustainable Development, Defra	1					1	1		1	
Grand Total	66	11	11	1	9	25	20	1	65	7

Note: Organisations external to Defra are highlighted in grey.
Key: BERR = Department for Business, Enterprise and Regulatory Reform; CLG = Common Language Group; DFID = Department for International Development; DfT = Department for Transport; ERFF = Environmental Research Funders Forum; ESRC = Economic and Social Research Council; GONW = Government Office for the North West; NERC = Natural Environment Research Council.
Potential MA elements: (1) Identifying and categorising ecosystems and ecosystem services; (2) Identifying links between human societies and ecosystem services; (3) Identifying direct and indirect drivers; (4) Selecting indicators; (5) Assessing conditions and trends of ecosystems and their services; (6) Assessing impacts on human well-being; (7) Developing scenarios; (8) Analysing response options; (9) Analysing uncertainty.

In the analysis below we broaden the analysis and interpret 'user' organisation who would potentially use the results of an MA-style assessment for their work, or who would need to take outputs from such an exercise into account in planning their activities or research strategies. They include:

- **Natural England (NE),** as a key statutory advisor to Defra NE's mission includes a focus on sustaining a healthy natural environment. Its remit takes in the importance of protecting and enhancing biodiversity, landscape and wildlife and understanding how management of these processes can underpin different forms of public well-being[18].
- **Forestry Commission (FC),** recognises that through the creation and management of forests and woodlands, there may be significant ecosystem service gains. The commission explicitly recognises, and seeks to foster, the benefits of woodland and forest development in terms of economic growth, public health and community development.
- **Environment Agency (EA)** is responsible for implementing the Water Framework Directive and for flood defence, for which its focus is normally on estuarine and coastal areas. It also has a specific responsibility to regulate pollution and monitor environmental quality (e.g. water quality on beaches or other recreational uses). The Agency is therefore predominantly concerned with impacts on the marine and terrestrial environment that have a direct impact on human well being. The MA-style assessment would be of value if it provided better information to help them manage rivers, coasts and seas. One of their four priorities within their Marine Strategy (2005-2011), for example, is 'Making sure that we all value our coastal and marine environment' through improving awareness of the impacts and the value of our coasts and seas'. Already the EA provides information on the status of the coasts and seas in terms of 'human use' and 'human impact' which is more akin to a goods and services approach. The EA is also in favour of a statutory marine spatial planning framework which will require an understanding of the impacts of proposed developments on goods and services and ultimately on human well being.
- **In the marine sector the Department for Business, Enterprise and Regulatory Reform (BERR)** plays a key role in providing permits for extractive industries (e.g. oil & gas and offshore wind applications). An MA-style assessment would therefore be of interest if this provided information on ecosystem services that assisted decision-making on licensing.
- **Natural Environment Research Council (NERC)** has a strategic remit to increase knowledge and understanding of the natural world and is taking an important lead in funding an evidence base that can characterise and monitor Ecosystem Services in light of the Millennium Ecosystem Assessment. A major area of work is improving methodologies and technologies for quantifying and comparing ecosystem services in the context of poverty alleviation. National seminar programmes exploring the idea of ecosystem services in different sectoral and geographical contexts, and building research capacity of the kind needed by an MA-style assessment for England, were initiated in 2007.
- **Economic and Social Research Council (ESRC)** has a strategic remit to understand and characterise the changing nature of economy and society

18 Natural England (Undated): Strategic Directions 2006-2009. http://www.naturalengland.org.uk/pdf/about/Natural_England_Strategic_Direction.pdf

both in the UK and Internationally. Among its thematic priorities the ESRC is investing in a number of research challenges relevant to the ecosystems approach in general and ecosystem assessment in particular, most notably work undertaken under its priority research area of "Energy, the Environment and Climate Change".

- **Engineering and Physical Sciences Research Council (EPSRC)** funds research in engineering and the physical sciences, and has particular interests in the built-environment and cross-sectoral research relating to sustainable development and sustainable consumption and production technologies. It is a member of the Environmental Research Funders Forum (ERFF).
- **Medical Research Council (MRC)** is also a member of ERFF.

In addition to the organisations noted above, there are other Statutory Advisors to Defra who would have a potential interest or involvement in an England MA-style assessment, including:

- **The Joint Nature Conservation Committee (JNCC),** which advises Defra on nature conservation, specifically in relation to UK and international issues. In the context of the marine environment, for example, JNCC advises Government on how to reduce human impacts on marine environments based on a programme of surveillance and monitoring that identifies status and trends in marine biodiversity. JNCC would be interested in an England MA-style assessment, both as providers of information to the UK government and in their role for the SEBI2010 process.
- **The Centre for Environment, Fisheries & Aquaculture Science (CEFAS),** which along with Natural England, provides scientific advice to Defra related to the marine and coastal zone and fisheries, in order to conserve and enhance the aquatic environment, promote rational management of natural resources and protect the public from aquatic contaminants. CEFAS's scientific research focuses on ecosystem interactions, organism health and resource management, and it also provides data for marine monitoring and fishery information. CEFAS would be an important potential user of the information in an England MA-style assessment, but they would also likely be responsible for providing much of the data that would feed into it.

Although Defra's current *Action Plan* provides a basis for identifying the sorts of information needs that an England MA-style assessment might serve, and the wider customer base for such an exercise, the picture must be refined. For example it is also valuable to consider the relevant committees led by or involving Defra personnel, such as:

The England Biodiversity Group, which involves stakeholders (Table 2.4) from public, private and the voluntary sectors, and advises the Government on the implementation of the UK Biodiversity Action Plan for England. In particular, it oversees development and delivery of the Biodiversity Strategy for England; and

Marine Advisory Policy Committee (MAPC), which advises the UK Marine Monitoring and Assessment Strategy (UKMMAS) by providing policy guidance to drive the design of monitoring and assessment so that it is able to answer questions for decision makers. This committee is currently chaired by Rodney Anderson (head of the Marine and Fisheries Directorate) from Defra, and the majority of the members are from Defra.

Other Government Departments with an interest in the potential outcomes of an MA-style assessment for England are as follows:

Table 2.4: Membership of the England Biodiversity Group

- Association of Local Government Ecologists (ALGE)
- British Trust for Conservation Volunteers (BTCV)
- Countryside Agency (CA)
- Department for Environment Food & Rural Affairs (Defra)
- English Nature (EN)
- Environment Agency (EA)
- Forestry Commission (FC)
- Local Government Association (LGA)
- Ministry of Defence Conservation Office (MOD)
- National Farmers Union (NFU)
- Country Land and Business Association (CLA)
- National Trust (NT)
- Wildlife and Countryside Link (Link)
- Royal Society for the Protection of Birds (RSPB)
- Wildlife Trusts (WT)
- Chairs of England Biodiversity Strategy Implementation Groups

- **HM Treasury -** The 2007 Comprehensive Spending Review (HM Treasury, 2006) made explicit recognition of importance of ecosystem services as part of natural resource protection and sustainability agenda, and recognised that environmental costs should be more explicitly taken account of in decision making. As a result there is likely to be increased attention to the importance and role of services across Government.
- **The Foreign and Commonwealth Office** who, along with Defra's International Sustainable Dialogues Team, are encouraging the use of findings of the MA-style assessment in initiatives overseas. They are also responsible for fisheries management in British overseas territories.
- **The Directorate of Policy and Research in DFID**, who have an interest in the extent to which the sustainable management or restoration of ecosystem services can play a role in poverty alleviation and are building capacity with NERC to do this.
- **Communities and Local Government (CLG)** have interest in the MA-style assessment to the extent that the Department's work is focused on setting policy for issues consistent with the MA's concerns including: housing, urban regeneration, planning as well as wider well being agendas such as community cohesion
- **Department for Transport (DfT) -** The recent review of methods of evaluating transport proposals published by DfT (2007), outlined a new approach to assessment that is designed to ensure that environmental, social and economic impacts are considered in a more balanced way. The document recognises the important role of environmental valuation and its application to impacts on ecosystem services but suggests that a number of methodological difficulties still need to be overcome.

There are also a number of private sector and non-governmental organisations that could be interested in the results of an England MA-style assessment as well as being able to contribute to the exercise. Within the marine sector, these include:

Organisations involved in policy and decision-marking:

- **The Crown Estate** plays a major role as it owns 55% of the foreshore and all the seabed out to 12 nautical miles, and therefore is involved in approving licenses such as offshore wind-farms. Although the Crown Estate operates as a business it also has a number of responsibilities to the nation and has adopted a sustainable development approach aiming to reconcile ecological, economic and social objectives. An England MA-style assessment could be of use to the Crown Estate to assist with decision-making on licensing and access to resourcing that balance the ecological gains or losses (in terms of good and services) with the economic or social costs and benefits. www.thecrownestate.co.uk/

Organisations involved in the fishing industry

- **Shellfish Association (SA):** aims to assist and promote the development of the Shellfish Industry in the United Kingdom. The Association mediates on a range of environmental issues ranging from coastal pollution, aggregate dredging to stock conservation. http://www.shellfish.org.uk/index.htm
- **National Federation of Fishermen's Organisations (NFFO)** is the representative body for fishermen in England, Wales and Northern Ireland. Its mission is to contribute to and advance EU and National Fisheries Policy to ensure a profitable, viable and sustainable fishing industry. http://www.nffo.org.uk/
- **Association of Sea Fisheries Committees of England & Wales** represents the national interests of the Sea Fisheries Committees and promotes those interests to Government and to stakeholders connected with inshore fisheries management and inshore marine environmental management. http://www.asfc.org.uk/
- **SeaFish** The Sea Fish Industry Authority (Seafish) works across all sectors of the UK seafood industry to promote good quality, sustainable seafood. Its research and projects are aimed at raising standards, improving efficiency and ensuring that the industry develops in a viable way. http://www.seafish.org

An MA-style assessment could assist these types of organisations to have more information on the status of marine goods and services, as well as the impacts of certain activities on the value of fisheries resource. They would also have an interest in how their activities affect the ecosystem and societal values, as well as being able to provide information on the value of their activities.

Organisations involved in extracting resources or use of the sea-bed

- **Energy Networks Association (ENA) is** the trade association for UK energy transmission and distribution licence holders and operators, acting in the interest of its members in the energy 'wires and pipes' sectors. http://2008.energynetworks.org/
- **United Kingdom Cable Protection Committee (UKCPC)** is an organisation of submarine cable owners, operators and suppliers and is primarily aimed at

protecting cable installations on the UK continental shelf and in promoting marine safety http://www.ukcpc.org.uk/

- **British Marine Aggregate Producers Association** (BMAPA) is the trade association for an industry that contributes some 6.4 per cent of the construction aggregates consumed in Britain. Marine aggregates form part of an overall portfolio of construction aggregate supply alongside the land-based quarrying industry and the recycled and secondary aggregate sector. The role of the UK's marine aggregate industry is to find and extract natural resources for the benefit of the nation as a whole. http://www.bmapa.org/
- **British Wind Energy Association** is the trade and professional body for the UK wind and marine renewables industries. Formed in 1978, and with over 310 corporate members, BWEA is the leading renewable energy trade association in the UK. (http://www.bwea.com)
- **Renewable Energy Association:** main objective is to secure the best legislative and regulatory framework for expanding renewable energy production in the UK. They undertake policy development and provide input to government departments, agencies, regulators, NGOs and others (http://www.r-e-a.net/home.fcm)

These organisations have an interest in an MA-style assessment in relation to its access to the sea floor in comparison to other uses of the resource. It is likely that such an exercise would include details of impacts of such activities on ecosystem goods and services. Again, they would also be able to provide information on their use of the resources and the associated values.

- **Conservation orientated NGOs**
  - **Coastal forums**: there are a number of coastal forums that exist throughout the UK to assist management of the coastal zone and involve or bring together stakeholders in the process. For example there is one for the Pembrokeshire coast, Dorset, Scottish and North Yorkshire and Cleveland coasts, among others. These forums could play an important role in assisting the completion of an MA-style assessment, as well as being important users of an MA-style assessment to assist their activities in protecting and using coastal goods and services.
  - **Wildlife Trusts:** The wildlife trusts are voluntary organisations that play an important role in the conservation of terrestrial and marine environments, as well as managing a number of nature reserves. In some coastal areas (e.g. Dorset and Kent) they are involved in research which could be used within an MA-style assessment. As with the coastal forums they would also be another audience for the MA-style assessment. http://www.wildlifetrusts.org/

2.5 Conclusions

The aim of this part of our report has been to identify what kinds of evidence needs Defra and its partners have in relation to the task of sustaining the supply of ecosystem services. The aim has been to cross reference these needs to the types of output that an England MA-style assessment might provide. In its *Action Plan*

Defra have highlighted five broad strategic issues to be resolved for the ecosystems approach to be used effectively:

- How are ecosystem services provided?
- What is the state of service provision?
- What will happen in the future?
- Does this matter?
- What can we do about it?

From the analysis presented above it is clear that all of these questions can, in principle, be answered by the types of evidence that an MA-style assessment might provide. The first two concern the need to assess the current situation and the latter two the design of policy responses – both of which are fundamental components in the generic MA-model. Although need for scenarios did not emerge as a strong theme in the analysis of Defra's current *Action Plan*, consideration of likely futures is nevertheless also helpful in the design and evaluation of different policy options. In addition to Defra's specific needs it is also apparent that there is also a wider constituency of organisations who would also have an interest in the sorts of output that an MA-style assessment might provide or the research and monitoring it might stimulate.

We conclude therefore that there is a *prima facie* case for some kind of national initiative which draws upon the concepts developed in the global MA. It would contribute to Defra's Ecosystems Approach *Action Plan* and there is a demand for certain elements of an MA-style assessment from both Defra and its advisory organisations. The extent to which a formal initiative called an 'England MA' is required, or whether the same kind of evidence can be achieved simply by investing in or expanding existing research and monitoring programmes is yet to be determined. This question forms the basis of Part 3 of our Report.

Part 3: Reviewing the Current Evidence Base

Key messages

- Some ecosystems and ecosystem services are better researched than others. In particular, the terrestrial environment is generally better covered than the marine, but there is an acute lack of information on the importance of biodiversity for securing ecosystem services in a national context.
- There are significant gaps in the information available on the state and trends in ecosystems and the output ecosystem goods and services, and the information on the linkages between ecosystems, ecosystem change and conceptions of human well-being is fragmented.
- The majority of existing national ecosystem assessment and monitoring programmes track changes in ecosystem health over time, in terms of ability of these systems to supply ecosystem services.
- The emerging evidence base on drivers of change has not yet been connect to an assessment of ecosystems services and where it is it is often at the wrong scale given the way decisions are made.
- There is little work on valuing ecosystem services and most existing approaches interpret valuation solely in economic terms.
- Tools and scenarios for evaluating potential alternative futures exist, but current scenario exercises are weakly related to current requirements of geography or scale.
- A case can be made for a more coordinated and coherent approach to assessing ecosystem services at national scales, and that the process of doing so could be seen as part of work to embed the ecosystems approach in decision making more generally.

3.1 Introduction

The analysis presented in Part 2 of this report suggests that there is growing policy interest in the question of ecosystem services, and that there is a need for evidence about their state and trends at a variety of scales for both the terrestrial and marine environments. Although there is no simple prescription for what an ecosystem assessment might entail, it is clear from the analysis presented that any national exercise consistent with the broad structure of the global assessment would potentially deliver a range of data that would inform decision making in Defra, its partner organisations, other government departments, and the wider business, NGO and research communities.

Although there are a range of monitoring, policy and research needs that could be fulfilled by an MA-style assessment, it does not follow that Defra should necessarily encourage or sponsor such an exercise. The context in which the global assessment was undertaken is very different to one in which a national scale assessment might be done, some years on. As result of the publication of the global study, for example, it may be that initiatives are now in place that would fulfil most of the needs identified in Part 2, without the necessity for Defra to take

the lead in an MA-style assessment for England. In this part of our report we therefore consider recent work and review the extent to which this already meets, or is likely to meet, the requirements identified earlier.

Our analysis is based on two sources of information. First, a review of the extent to which current or proposed research, monitoring and assessment initiatives might provide the kinds of evidence about ecosystem services that is required. Second, the analysis of feedback gained from a round of expert consultation with key informants drawn from Defra, its agencies and the wider research and policy communities on the need for an MA-style assessment for England. The expert consultation involved: a questionnaire circulated to an Advisory Group identified together with Defra at the start of this project; a one-day workshop organised by the project team for a wider range of policy stakeholders.

The documentary material considered has been listed and summarised in Appendix 2 and Appendix 3:

- In **Appendix 2** we cross reference the eight sets of needs identified from the analysis of Defra's *Action Plan* (Section 2.1) against recent studies funded or prepared by the Department or its close partners.
- In **Appendix 3** we review existing data, information and ecosystem monitoring and assessment processes in England and cross reference them to the MA framework. The material is separated into five ecological groupings for terrestrial ecosystems: birds, butterflies, mammals, plants, habitats; and three for marine ecosystems: productive seas; healthy and biologically diverse habitats, and clean and safe seas. For each group two summary tables have been provided:
    - The first present the key monitoring and assessment work relevant to each group, main source for results/monitoring schemes and the utility of the monitoring and assessment process within an MA-style assessment for England.
    - The second summarises the most likely reasons for changes in the status of these species groups, using the categories of pressures affecting biodiversity established by the Millennium Ecosystem Assessment. It also notes the UK studies that currently provide evidence in relation to the pressures identified.

In terms of the wider consultations that we have made, the details of the questionnaire and workshop are kept anonymous and are for Defra and Team internal use only. They are not provided in this report.

In this part of our report, we review these materials presented in these appendices in terms of the broad requirements for evidence identified in Part 2 and the ways they would be supported by the nine components of the 'global MA model' (Figure 1.1). The aim is to determine the extent to which current initiatives are sufficient to meet these needs, or whether there are significant gaps that could be filled by an MA-style assessment for England.

3.2 Meeting the Evidence Needs

3.2.1 Conceptualising Ecosystem Services and Communicating their Importance

One of the primary purposes of the global MA was to raise awareness of the importance of ecosystem services amongst decision makers. By making the link to human well-being, the initiative demonstrated forcefully that arguments about the protection of species and ecosystems are not merely about conservation of biodiversity. It showed that they can also be made in terms of the role of ecological systems in sustaining people's livelihoods and quality of life. Therefore, if an MA-style assessment were undertaken for England, and it followed in some respects the global MA model, then it might have similar benefits. To what extent would it be valuable for Defra to sponsor such an awareness-raising exercise?

The House of Commons Environmental Audit Committee also considered the awareness issue, and they were "disappointed" by the lack of engagement with the MA findings in some sectors, particularly by NGOs. In their recommendations they argued (para. 8, p.4) that "we must ensure that policy-makers are both fully aware of the implications of the global MA and that they respond to its challenges" (House of Commons Environmental Audit, 2007a, p.4). For this to be achieved, they suggest that policy-makers must understand the economic, social and environmental benefits arising from the sustainable management of ecosystem services and see the importance of adopting an MA conceptual framework. They conclude:

> This must happen in such a way that effective national and local response options can be initiated. Therefore it should be a priority to carry out national assessments tailored to national needs (House of Commons Environmental Audit, 2007a, p.8).

The Committee advises that this conclusion should shape the UK's role in helping the international community design mechanisms for taking the MA process forward. The proposition clearly also applies in a national context. It could be argued that as a country, unless we also ensure that our own decision-making takes full account of the benefits environmental systems provide, it is unlikely that we can achieve the goals we have set for sustainable development.

The Committee took its evidence at the end of 2006, and clearly the situation may now be different. Defra has built on the programme of work it started before the Committee sat, to actively promote the ecosystems approach through the development of its *Action Plan* (Defra, 2007a). It has also highlighted the importance of making economic assessments of the benefits ecosystem services provide, through the recent publication of its introductory guide to valuation (Defra, 2007b). Although Defra acknowledged to the Committee that its proposed research programme did not amount to a 'full MA' (House of Commons, 2007b, para. 128, p45) much has clearly been achieved in widening interest in the issues both as a result of its leadership and more general appreciation of what the global MA achieved.

The development of the two phases of the Defra's Natural Resource Unit's research programme, for example, has moved from the consideration of more general issues surrounding the management of natural resources, to a more focused programme dealing explicitly which issues relating to ecosystem services. Thus Phase 1 work included:

- A review of the types of data available for assessing and monitoring natural resource systems (Osborn et al., 2005, Appendix 2, document 1);

- An analysis of the relevance of current ideas about sustainability limits that can be used to inform policy debates (Haines-Young et al., 2006, Appendix 2, document 2); and
- An assessment of the availability and role of economic valuation tools in natural resource management (Eftec, 2006, Appendix 2, document 3).

By contrast, in Phase II a number of studies were commissioned, including:

- An assessment of the state and trends of the ecosystem services associated with England's major terrestrial ecosystems based on existing data (Haines-Young and Potschin, 2008, Appendix 2, document 9); and
- The valuation of England's terrestrial ecosystem services (Jacobs, 2007, Appendix 2, document 10).

In parallel to Phase II Defra has also organised a series of workshops and meetings[19] that have provided the opportunity to discuss the implications of these studies and the implications of other relevant research.

There have also been a number of initiatives and reports undertaken that attempt to identify and categorise marine ecosystem services for the UK, and provide information on their values and/or economic importance. This includes the following reports commissioned by Defra in preparation of the Marine Bill:

- Identification of species and habitats that contribute to the delivery of ecosystem services provided by the marine environment (Frid and Paramor, 2006, Appendix 2, document 32);
- Presentation of a typology of marine services and their values (Beaumont et al., 2006, Appendix 2, document 38)
- Analysis of the benefits of marine nature conservation proposals in the bill in terms of ecosystem services (SAC & University of Liverpool, 2007, Appendix 2, document, 36); and,
- Analysis of the potential costs to businesses of the Marine Bill (ABP, 2007, Appendix 2, document 35).

However, despite this body of work there are still gaps in the understanding of ecosystem services related to the marine environment. For example, Beaumont et al. (2007) (Appendix 2, document 38) highlighted a lack of values available for some marine ecosystem services such as resilience and resistance, bioremediation of waste, biologically mediated habitat and options use. The BRAG report on the marine biodiversity (see below) highlighted that there are critical research needs to establish linkages between biodiversity and ecosystem functioning which is required to have a comprehensive view of the relevant marine ecosystem services.

Outside Defra's research programme there is further evidence of growing awareness regarding the importance of considering ecosystem services in a number of other organisations. UKBRAG has published two studies, one for the terrestrial and one for the marine environment, on the policy and evidence needs concerning the relationship of biodiversity and the output of ecosystem services (Ferris, 2007 and Austin et al., 2008, Appendix 2, documents 17 and 18). Natural England published a report in 2006 providing a detailed catalogue of ecosystem services for three priority habitats (inter-tidal/coastal; broadleaf woodland & freshwater wetlands (Appendix 2, document 40).

[19] http://www.defra.gov.uk/wildlife-countryside/natres/eco-actionp.htm

NGOs such as RSPB (RSPB, 2007, Appendix 2, document 26), *Moors for the Future*[20] and the Wildfowl & Wetland Trust (2006) have considered ecosystem services as part of their visioning work for uplands and wetlands. WWF has also embraced this approach within its consideration of Marine Protected Areas in the UK and commission a report to assess the value of associated ecosystem services (Appendix 2, document 39).

Finally NERC and ESRC have supported activities in this general area, by funding a set of transdisciplinary seminar series on different aspects of ecosystem services[21], and in partnership with DFID and Defra, research on the role of ecosystem services in poverty alleviation[22]. Most significantly, ecosystem services are a strong theme in the new *Living with Environmental Change* Programme led by NERC[23].

There is little doubt therefore that compared to the time at which the House of Commons Environmental Audit Committee took its evidence there is greater awareness of the concept of ecosystem services and the contribution that the MA has made to thinking in this area. The examples cited in this review are only part of a growing body of material that suggests that the thinking is being taken up by a growing number of key organisations.

We tested the issue of the need for further awareness-rising through our consultation with experts. It was apparent that in terms of what a national MA-style assessment might deliver, it was the analytical aspects rather than the conceptual elements that were likely to be most valuable. Although it was felt that there would have to be some tailoring of concepts and definitions of ecosystem services if the assessment framework was applied at the England level, current work probably is already helping people to better formulate and communicate ideas about ecosystem services, although there was still a gap between the terrestrial and marine sectors.

There was common agreement that the importance of the link between human well-being and ecosystem services still needs to be more widely understood, but as one respondent from the research community indicated this "...is not just a matter of identifying the links, it is knowing about their scale and importance to human welfare." They went on to stress the importance of framing assessments in terms of economic valuation. In the workshop, participants also suggested that any national exercise would have to be designed to "focus on services that are most valued by people". Taking up this idea, another participant suggested that this focus should relate to impacts on "...housing, land use, planning policy and practice." Nevertheless, by stressing more strongly the links between ecosystem services and well-being, another felt that better awareness of the need for ecosystem assessments could "... act as a catalyst for change in thinking" for both policy makers and those concerned with environmental monitoring.

In terms of the general need to better conceptualise ecosystem services and communicate their importance to decision makers more widely, it seems clear that while a national exercise would be helpful in this respect, given the level of current interest such an exercise could not be justified simply by the need to raise awareness and promote understanding. As one concluded "This is evolution rather than revolution, and a great deal of the existing monitoring and reporting base can be used to fuel the process of assessment of ecosystem services." The extent to

[20] http://www.moorsforthefuture.org.uk/mftf/main/Home.htm
[21] http://www.nottingham.ac.uk/fresh/
[20] http://www.nerc.ac.uk/research/prpgramme/espa
[23] http://www.lwec.org.uk/

which these activities are, in the words of the Environmental Audit Commission, sufficient for "effective national and local response options" to be made, must now be explored.

3.2.2 Case Studies

Case studies played an important role in the global assessment for a number of reasons, one being due to the difficulties of acquiring comprehensive and consistent data at a range of scales on the state and trends of the world's ecosystem services, with the time and resources available. Instead, the assessment was in part based on the evidence from a number of sub-global, regional and local studies that employed the MA's conceptual framework. These studies were used to compare differences in the role that ecosystem services played in different parts of the world at different scales, illustrate key issues and test the robustness of the global assessment. Although UK supported the global assessment, no case study material was provided.

As noted above, through its Phase II NESU research programme, Defra has now funded a number of studies that are beginning to provide insights into the application of the Ecosystems Approach and the tasks of making ecosystem assessments. Specifically, these recent projects have looked at: how ecosystem services can be handled in making planning decisions (Collingwood Environmental Planning 2008, Appendix 2, document 11); how it could be brought into Environmental Impact Assessments (ADAS, 2008, Appendix 2, document 12); the development of integrated environmental strategies at the catchment scale (Potschin et al., 2008, Appendix 2, document 13); and the management of protected wetland areas (McInnes et al., 2007, Appendix 2, document 14). More generally, attempts have been made to develop a concept of environmental capacity using notions of environmental functionality and ecosystem and environmental service as a way of exploring whether there are environmental thresholds in relation to development in the Eastern Region of England (Land Use Consultants, 2006, Appendix 2, document 21). Natural England has recently commissioned a study on modelling and mapping ecosystem services in the uplands of England (Haines-Young et al., 2008), Appendix 2, document 23).

Within the marine environment there are fewer comprehensive case studies that look at how the ecosystems approach can be used within planning decisions. However, ecosystem valuation is increasingly playing a role to assist planning decisions. For example, a study was carried out by the Wildlife Trusts to estimate economic values of proposed conservation zones in Lyme Bay to compare the value of scalloping versus non-damaging uses of the sea bed. The study concluded that other uses are more valuable than scallop dredging, arguing in favour of the conservation zone on this basis (Homarus Ltd, 2007, Appendix 2, document 44).

Investment in case studies is important because it allows concepts and tools to be tested and refined in a focused way. They are of course no substitute for a comprehensive and systematic assessment of ecosystem services, if such an exercise is in fact deemed necessary. Indeed, it could be argued that the case study route may produce a rather fragmented evidence base, and that there may be still some more overarching assessment framework. We tested this idea further in our workshop discussions.

We asked workshop participants to consider the need for an MA-style assessment, given the range of current activities and initiatives. Although it was agreed that the level of activity in this area had increased with the publication of the global study, it was generally felt that at the national scale, gaps in the current evidence

base could be identified. We will examine the details of these gaps in the sections that follow. At this stage it is more important to note that the consensus was that although case studies and focused research projects were valuable, a national MA-style assessment would, in the words of one participant, "... provide an opportunity to bring together a lot of information sources and provide some kind of effective narrative in terms of the state and trends of the environment."

There was, however, a clear sense from the workshop discussions that the need for coordination and synthesis had to be balanced against, and possibly kept separate from, the need for more evidence. It was observed for example that compared with many other European countries the UK is particularly well placed in the range of information available to policy makers. Indeed, one participant added "Given that there is a relative wealth of evidence in the UK compared to other countries you might ask is there a need for an England MA-style assessment?" However, it was also suggested that:

> "Almost regardless of whether an MA would produce any new evidence, there's definitely [value] on the process of pulling people together and communicating effectively in a way that has impact on policy. We have trickles of evidence; there are lots of different trickles. But you don't have a huge impact unless you bring them together."

In the basis of existing initiatives and case study work, it seems that if a case for an MA-style assessment has to be made, it is perhaps most effectively done in terms of the general need for coordination and synthesis than simply as an awareness raising exercise. The extent to which such an exercise could add significantly to the current evidence base must now be examined.

3.2.3 Understanding the Drivers of Change

The need to understand the drivers of change and their potential impacts is generally considered to be a major concern for policy makers. It is striking, therefore, that the analysis of evidence needs made in relation to Defra's *Action Plan* (Table 2.5) did not suggest that the understanding of drivers and scenarios was a major immediate requirement.

It could be argued that the importance of developing an understanding of direct and indirect drivers is implicit the issues covered in other parts of the *Action Plan* (e.g. in relation to indicators and state and trends). Certainly it must be recognised that Defra has acknowledged the importance of the topic, by funding several studies in this area. These include an investigation of the ways in which pressures upon natural resource systems can be characterised (Atkins, 2006, Appendix 2, document 4) a report on key trends and their associated implications for natural resources by Fast Futures (2005)[24] and on the development of cross-cutting scenarios, linking change in the environmental, technological-scientific, socio-demographic, economic and political spheres (Merme et al., 2005, Appendix 2, document 7). In the marine environment, there has been some scenario work to explore different options for Marine Protected Areas policies (Richardson et al,. 2006, Appendix 2, document 33; and work to assess what four future scenarios means for the key uses of the marine environment (i.e. fishing, tourism, ports, coastal defence, oil & gas etc) (Defra, 2006, Appendix 2, document 43).

24 See Project SD0314
http://www2.defra.gov.uk/research/Project_Data/More.asp?I=SD0314&M=KWS&V=Natural

The review of materials presented in Appendices 2 & 3 of this report suggest **that there is limited systematic monitoring of the drivers of change that impact on ecosystem services, and only a few studies that allow a detailed consideration of possible future trends, especially in relation to the impact of climate change.** While some of this work has explicitly suggested that links to emerging research into ecosystem services could be usefully drawn (see Fast Futures 2005) the monitoring programme tend to focus on the effect of different pressures on biodiversity, rather than ecosystem services *per se*. The exploration of these issues through the funded research programme has tended to look at them in a general way, and not from the perspective of sustaining or managing ecosystem services. In the marine sector there are few scenario studies and none that link land and sea issues. Recent marine scenario studies have been quite specific– for example to evaluate the suitability of different policy options (e.g. Richardson et al., 2006), rather than to look at the state and trend of ecosystem services *per se*.

Again we tested the need to better identify and understand the direct and indirect drivers of change through our consultations with experts in the field. It was generally agreed that the identification of the drivers of change was an important and essential task, especially for understanding "where to target interventions". It was also regarded as "essential for economic analysis, including valuation". However, there was also a diversity of views about the contribution than an MA-style assessment might make in relation to this particular area of concern. There were some, for example, who regard the identification of the drivers of change as essentially a research issue; one contributor argued that fundamentally there was a need for systems modelling to understand "the impact of interventions, policies and responses". Such activities probably fall outside the potential scope of any national assessment exercise, which like the global exercise, would tend to take 'as read' the underlying cause of change.

The tensions between the need to stimulate more primary research and the practical requirements of an assessment exercise are particularly well illustrated in relation to the need for refining our understanding of the direct and indirect divers of change for ecosystem services. The discussion in this area to some extent mirrored those surrounding the adequacy of case studies, and serve to emphasise that the need for research and assessment probably cannot be looked at in isolation. **What ever form an MA-style exercise took it would seem wise to address the need to link research and policy agendas so that robust outcomes can be achieved.**

3.2.4 Indicator Design, Selection and Usage

If the protection of ecosystem services is seen as an important policy objective then we need indicators to understand what is happening. The review of recent work and current monitoring schemes in Appendices 2 and 3 suggest, however, that there is an acute lack of information on the importance of biodiversity for securing ecosystem services, and very little information on the linkages between ecosystems, ecosystem change and human well-being[25]. Thus this is an area of work that needs to be encouraged.

In the past, Defra has funded work on how ecosystem health might be conceptualised and monitored (Raffaelli et al., 2004, Appendix 2, document 6) and has recently commissioned a review of the targets and indicators that underpin

25 See outcomes of ESRC/NERC Transdisciplinary Seminar Series on understanding the links between ecosystem services and human well-being, Seminar 2, (http://www.nottingham.ac.uk/FRESH).

the Ecosystems Approach (Linstead et al., 2008). Such work could clearly inform the design of an England MA-style assessment, although it will not, by itself, generate new evidence unless it is linked to the design of new monitoring systems.

Similar exploratory work appears to be required in the marine sector, and particularly on its links with the terrestrial environments. Identifying indicators that measure marine ecosystem health requires a clear understanding of causal factors which is not always available. For instance it may be possible to measure changes in fish stocks, but research is still assessing the importance of different drivers such as fishing pressure, water temperature or recruitment substrate. The recent UK BRAG report (UK Biodiversity Research Advisory Group, Austin et al., 2008) outlined for the need of policy makers to have information on the marginal changes in value resulting from impacts (e.g. how does fish productivity change with changes in km^2 changes in habitat?). A particular problem in quantifying marine goods and services, however, is the difficulty in linking them with the current indicators that are monitored.

There are a number of indicators that are measured in the marine environment under different research programmes. These include UK obligations for monitoring under the OSPAR Convention for the Protection of the Marine Environment of the North East Atlantic (coordinated by JNCC), fisheries research under International Council for Exploration of the Sea (ICES) (coordinated by CEFAS), as well as national monitoring programmes e.g. Targets, Milestones and Indicators within the Coasts and Seas chapter of the Biodiversity Strategy for England (Defra, 2002). In order to assist the coordination of these monitoring programmes, and provide the evidence base to measure progress on the Defra 2002 Safeguarding Our Seas Strategy, a UK marine mongering and assessment strategy (UKMMAS) was set up in May 2006.

Initiatives are being taken forward to develop frameworks to incorporate more of an Ecosystem Approach into marine monitoring and assessment. For instance JNCC has been working with OSPAR and UKMAAS to develop a joint framework that groups indicators under ecosystem components and against impacts (Table 3.1) (Connor, 2007). The indicators that populate the table are both OSPAR Ecological Quality Objectives (EcoQOs) which are used to measure ecological status of ecosystems, indicators for OSPAR listed species and habitats and . There are plans to integrate ICES indicators into this framework and for it to answer requirements of the EU Marine Strategy Directive. This exercise is also being undertaken in order to identify key gaps in monitoring that hamper assessment of status and trends and information for policy making.

The proposed OSPAR/UKMMAS monitoring and assessment framework (Table 3.1) does not, however, currently explicitly consider ecosystem services. This reflects both the current structure of monitoring programmes, but also the difficultly in linking current indicators to ecosystem services. In some cases this may be due to a lack of information on the linkages between changes in ecosystem structure and the effects of this on ecosystem function and services (MRAG & WCMC-UNEP, 2007).

Table 3.1 Proposed monitoring and assessment framework under development by OSPAR and UKMMAS

Type of Impact	Activity causing impact	Plankton	Fish-pelagic	Cetaceans	Habitats	Nutrient levels	Contami-nant levels
Eutrophication	Aquaculture	Phytoplakton indicator spp.					
Eutrophication	Land-based pollution	Chrlorophyll c Phytoplakton indicator spp.				Winter nutrients (DIN & DIP)	
Habitat transformation	Coastal development				Littoral Mudflats		
Community structure changes	Aggregate extraction				Density sensitive sp. e.g. reefs		
Community structure changes	Benthic trawling				Density sensitive species e.g. mussel reefs		
Removal of non target species	Pelagic trawling		Basking shark	By-catch harbour porpoise			
Noise disturbance	Seismic survey						

	No impact
	Low impact
	Moderate impact
	High impact

Tables 3.2 gives an initial illustration of which OPSPAR EcoQOs and Defra's Biodiversity Coastal and Sea Indicators can be linked to the marine ecosystem services highlighted within the MA, and those that are not directly linked. This is not a conclusive analysis and is open to considerable debate, but illustrates where linkages may be missing or are unknown.

In summary for marine systems there is still considerable theoretical work to do in order to develop indicators linked to ecosystem services. These include:

- agreeing categorisation of marine ecosystem goods and services;
- linking ecosystem services with current indicators that are being measured (i.e. understand the casual factors);
- identifying additional indicators for ecosystem services where there are gaps; and,
- aligning the approach into a wider framework or strategy (e.g. OSPAR framework) that will provide overall guidance to UKMMAS.

Clearly a national MA-style assessment could provide support for the better alignment of current indicators with ecosystem services and ultimately elements of human well-being. It may also act to coordinate activities across the terrestrial and marine environments so that a coherent framework for investigating ecosystem services is developed.

Table 3.2: Potential linkages between existing marine indicators and ecosystem service categories

Marine ecosystem Services (as defined by Beaumont et al., 2007 and adapted from the MA)	**Marine Goods and Services Categories** (as defined by Beaumont et al., 2007)	**Potential linkages between existing indicators and MA ecosystem services** **Listed for *OSPAR EcoQOs* &** DEFRA coastal and sea Biodiversity Targets, Milestones & Indicators (UK Biodiversity Strategy)	**Existing indicators not directly linked to ecosystem services**
Production/Provisioning services	Food provision	***Spawning stock biomass of commercial fish species*** UK fish stocks within safe limits	***OSPAR EcoQOs*** ***Phytoplankton indicator species for eutrophication*** ***Proportion of oiled common guillemots among those found dead or dying on beaches*** ***By-catch of harbour porpoises*** ***Changes/kills in zoobenthos in relation to eutrophication*** ***Imposex in dogwhelks*** ***Phytoplankton chlorophyll a*** Marine Biodiversity Indicators Marine Biodiversity Number & size (or % of resource of coastal and inshore marine Natura 2000 sites; number with management plans; condition of coastal SSSIs in England Marine inputs: cessation of discharges, emissions and losses of hazardous substances by 2020 Level of cetacean by-catch in UK waters
	Raw materials		
Regulating services	Gas and climate regulation	***Oxygen***	
	Disturbance prevention (flood & storm protection)		
	Bioremediation of waste		
Cultural services	Cultural heritage and identity		
	Cognitive benefits		
	Leisure and recreation	Population of coastal and seabirds	
	Feel good factor	***Seal population trends in the North Sea***	
Supporting/Overarching support services	Resilience and resistance	Progress towards coastal and marine SAP/HAP targets	
	Biologically mediated habitat		
	Nutrient cycling	***Winter nutrient concentration levels***	
Option use value *(not included in the MA)*	Future unknown and speculative benefits		

Once again, we tested these ideas through expert consultation and there was a general consensus that an MA-style assessment might stimulate some valuable work in this area. For example, while it was noted generally that a large number of indicators are available to the science and policy communities, the findings from our review presented above was largely confirmed by those contributing to discussions. There still is, one expert suggested, a requirement for "stronger links between environmental indicators and well-being".

Another noted that "RSPB already lead in using birds as indicators of sustainable development and it would be useful to extend this to indicators of other ecosystem service delivery." In terms of the current suite of indicators that are available, another consultee suggested that "we have to be clear that most such metrics were not designed to reflect broad swathes of ecosystem services ..... and so interpretations from pre-existing indicators have to be cautions". The aim, another expert suggested, should be to develop "fewer, more coherent indicators". While the selection and design of potential indicators would clearly draw upon existing research and monitoring studies, there is little doubt that a national assessment initiative would help refine existing ideas about how the links between ecosystem services and human well-being might be measured. If the main purpose of an MA-style assessment is to inform decision makers about the state and trends of ecosystem services, then success will depend fundamentally on developing metrics that are both sensitive to the major drivers of change and the effects of policy interventions, and easily understood by a wide range of potential users. **Thus the impetus that an MA-style assessment would give to the task of designing new, policy relevant indicators could be a significant part of the case that could be made for it.**

It could also be argued that the stimulus for the outputs of a national assessment exercise might give to the development and use of a focused set of indictors that link ecosystem services and human well-being may be a crucial step in achieving Defra's goal of embedding the Ecosystem Approach in decision making. Indeed, in the workshop discussions and other consultations, a number of participants stressed that the process of making an assessment might in fact be as important as its content. The extent to which an MA-style assessment might stimulate beneficial institutional change will be discussed below. For the moment, the contribution it might make to the development of policy relevant indicators should be noted.

3.2.5 Assessing State and Trends

The analysis presented in Appendix 3 suggests that there is currently insufficient information on the state and trends in ecosystems, particularly of ecosystem goods and services in England. The majority of existing ecosystem assessment and monitoring systems do not track ecosystem health over time, and assess the ability to supply ecosystems services. Indeed, most ecosystem assessment and monitoring frameworks identified use an ecocentric approach (centred on the ecosystem or environment) unlike the MA framework, which is anthropocentric (centred on human well-being). As a recent study for Defra has shown, some ecosystems and ecosystem services are more researched on than others, and monitoring data is fragmented and difficult to integrate across all habitats and services (Haines-Young and Potschin, 2008). Some of these deficiencies in relation to making assessments of terrestrial systems are likely to be overcome with the publication of the Countryside Survey 2007[26]. However, it will mainly provide insights at national

[26] http://www.countrysidesurvey.org.uk/

rather than the local level, which is the scale at which many decisions affecting ecosystem services are often made.

A similar, incomplete and fragmented picture exists for the marine sector. Assessments of state and trends of the marine environment in the UK are coordinated by UKMMAS through a number of different reporting initiatives. The key assessment of status and trends of marine ecosystems in the UK is the Charting Progress report which reports against the government's 'Safeguarding Our Seas' Strategy. The first assessment was undertaken in 2005 and Charting Progress 2 is due in 2010. In addition to charting progress the UK also provides Quality Status Reports (QSR) to OSPAR with the next report also due in 2010 and reporting against Good Environmental Status reporting that will come on stream with further development of the EU Marine Thematic Strategy. There are also obligations under the Water Framework Directive although this is currently coordinated by the EA.

The extent to which a national MA-style assessment is needed to provide a picture of the state and trends of ecosystem services and their impacts on human well-being is clearly the central issue for this study, and as might be expected, it formed a major part of the discussions we had with consultees. There was general agreement that there was still much to be done in this area. In terms of both understanding trends and impact on human well-being it was suggested that "there are some examples, but this is not comprehensive enough. Big gaps remain". In terms of designing better monitoring systems, it was also suggested that there was a need to "reduce duplications, contradictions and resource use in existing reporting and assessment".

The consultees also suggested that work should proceed with caution. For example, it was suggested that more effort was required to identify the beneficiaries that were associated with particular ecosystem services. However, we must, as one consultee put it, "... be careful of making sweeping and unsubstantiated generalisations about the links..." They added:

> "....there are certainly many metrics of ecosystem health that can, with critical appraisal, be used to support assumptions about implications for human well-being. A key issue here though is that the 'ecosystem service' approach demands that multiple simultaneous benefits are evaluated in parallel".

Such comments echo those reported earlier concerning the possible role that a national MA-style assessment might have in coordinating thinking. Clearly any such national exercise would have to draw upon existing initiatives, but it could still add considerable value if it allowed different strands of work to be integrated. As one workshop participant remarked "I think one of the interesting discussions around an MA-style assessment for England will be how you reengineer all that existing information into a context which is trying to put ecosystems into a policy context, which is currently not in there".

3.2.6 Understanding Values

The importance of valuing natural resources and ecosystem services was recognised in the analyses for the 2007 Comprehensive Spending Review (HM Treasury, 2006), and has been further emphasised by Defra in its recent publication of a valuation guide for policy makers (Defra, 2007b). In the marine sector a number of recent studies have attempted to value ecosystem services and illustrate how the analysis of costs and benefits of policy proposals can be a

valuable decision making tool (Beaumont et al., 2006, Appendix 2, document 38), SAC and University of Liverpool 2007 (Appendix 2, document 36) and ABP Marine Environment Research Ltd et al. (2007, Appendix 2, document 35).

There is also work in progress on valuing marine ecosystem services:

- The EU project COST-IMPACT has examined the impact of trawling on the value of marine ecosystem goods and services; and,
- The EU Network of Excellence MarBef Theme 3 – The socio-economic importance of Marine Biodiversity.

As a result of recent work funded by Defra, it is claimed that the concept of 'Total Economic Value' (TEV) provides one useful tool for valuing ecosystem services, but that the categories of services proposed in the MA may need to be adapted (Jacobs, 2007). Such an approach to valuation appears to be most tractable for provisioning services, but difficult both operationally and conceptually for the regulation and cultural groups. For example, in the valuation study of Beaumont et al. (2006) there were a lack of values available for some marine ecosystem services such as resilience and resistance, bioremediation of waste, biologically mediated habitat and options use. In some cases it is difficult to assign values to habitats where there is a complex link with services such as 'food provisioning' highlighting need for research in this area. Furthermore there are still major difficulties of using the information collected in one situation to predict values elsewhere.

Thus further work in the area of economic valuation of ecosystem services is probably required, particularly in relation to the problem of benefits transfer. Indeed the lack of valuation information was one of the major shortcomings of the global MA, and it is likely that it will be a far stronger component in any future exercises at any scale. **Such economic valuation studies could be undertaken and coordinated through an MA-type exercise for England, which would have the particular advantage that the analysis could be used to help policy makers understand how marginal values will change under different assumptions about the future.**

The view that valuation approaches still need to be refined so that they can be used more easily in decision making was one shared by those consulted during this study. The MA itself, for example, suggested a much wider understanding of value than the simply economic[27]. **Thus an MA-style assessment might bring considerable focus to the debate about values, which many felt was necessary.** It was suggested, for example, that such an exercise would provide the opportunity to start "…. moving away just from accepting ecosystem services as they are: trying to define the costs opportunities and risks for sustaining well-being as a means of communicating with the public and the politicians. So, redefining ecosystem services and actually finding out what the people value."

A national study might be one way in which this could be achieved. An expert familiar with the issues surrounding the global assessment observed that "gaps exist in the identification of the whole range of ecosystem services and in valuing the impacts …This would need to be prioritised in an England MA." They added, however, that the inclusion of a strong valuation element in a national exercise was essential, because "…valuation translates ecosystem services into terms that decision-makers and the general public can readily understand, and economic incentives have the potential to improve the ecosystem management." It is

[27] http://www.millenniumassessment.org/documents/document.304.aspx.pdf

interesting to note, however, that some tensions over the role that economic valuation might play in decision making were evident in discussions.

The monetisation of benefits and impact might not be all that is necessary. We also have to find better ways of dealing with and communicating uncertainties and in understanding the trade-offs that might be made in decision making in terms of wider sets of social values. Another consultee even went so far as to suggest that we "should avoid total economic value" because presumably it diverted discussion from more important underlying issues. In terms of the whole debate, feedback from a group of experts at the workshop suggested that:

> "It's really trying to get engagement with things that mean something to people, and talking about water, flooding and water supply that will have more meaning to people, rather than ecosystem services. It's trying to get the language and the concepts more acceptable and engaging"

In summary, therefore, it appears that a national MA-style assessment would potentially have much to contribute to a better understanding of the value of ecosystem services. Not only could robust economic assessments play a particularly useful role in constructing the sorts of "compelling narrative" that many consultees felt was necessary the Ecosystem Approach was to be embedded in decision making. It could also help broaden our understanding of value for society, by emphasising the role decisions about ecosystem services play in resolving questions of social justice and equity of opportunity.

3.2.7 Designing Response Options

The global MA not only focused on making an assessment of past and current trends, but also sought to direct attention to what the future might hold and what policy responses might therefore be necessary. A key component of this part of the exercise was the development of a set of scenarios describing a range of potential futures and what consequences they might have for ecosystem services and human well-being.

The development and use of scenarios is, of course, not unique to the global MA. Indeed, for many scenario studies are an essential part of the policy development process and an increasingly wide range of 'plausible futures' are available as the basis for discussion and reflection by policy makers (see for example, the recent review by the EEA, 2007). Given the range of material that is now available the crucial question is whether more scenarios studies are required. Thus we have sought make a critical review material that is relevant to the question of ecosystem services in UK, to determine whether there are any gaps that might usefully be fulfilled by work undertaken within a national MA-style assessment.

Table 3.3: Examples of Scenario Work

Scenario Title and Origin	Spatial and Temporal Scale	Thematic Focus
Millennium Ecosystem Assessment (MA, 2005)	Global – 2050	*Ecosystem services*
Energy Needs, Choices and Possibilities: Scenarios to 2050 (Shell, 2001)	Global - 2050	*Energy*
Population and Scenarios: Worlds to win (Hilderink, 2004)	Global - 2100	*Population*
Prelude: Land-use scenarios for Europe: European Environment Agency (2007)	Europe -2035	*Land use*
Four Futures for Europe (De Mooj and Tang, 2004)	Europe	*Economy*
Integrated Visions for a Sustainable Europe (Rotmans et al., 2001)	Europe	*Environment*
Emission Scenarios: UK Climate Impacts Programme (2007)	UK 2020-2090s	*Climate change*
Intelligent Infrastructure Futures: The Scenarios – towards 2055/ foresight project (Curry et al., 2006)	UK - 2055	*Transport & technology*
State of the Countryside 2020 / Tomorrow Project (Countryside Agency, 2003)	England - 2020	*Rural change (general)*
Rural Futures Project: Scenario Creation and Backcasting (Future Foundation/Defra, 2005)	England 2024/2054	*Rural change (general)*
Agricultural Futures and Implications for the Environment (Cranfield University/Defra, 2005)	England and Wales - 2050	*Agriculture and Environment*
Alternative future scenarios for marine ecosystems (Defra, 2006)	UK – 2020	*Marine ecosystems*
MA scenarios for the Parrett Catchment (Potschin et al., 2008	Regional – catchment - 2050	*Flooding, housing, etc.*

The utility of the scenario studies shown in Table 3.3 have been assessed in terms of their time-scales, the assumptions on which they have been built, and their sensitivity to an assessment of ecosystems services in an English context. As a result it has been possible to categorise scenarios into four 'ideal' types (see Table 3.4).

The first ideal type refers to what we term *England 'Strong' but Ecosystem 'Weak' Scenarios*. These are exercises in scenario building wholly or closely concerned with changes that may take place in England but which are largely disconnected from an account of ecosystems. Examples of this type of work include the *State of Countryside 2020* developed by the Tomorrow Project/Countryside Agency (2003), the *Rural Futures Project: Scenario Creation and Backcasting* by the Future Foundation/Defra (2005) and the emissions scenarios of *The UK Climate Impacts Programme* (2007). Such studies contain relevant and immediate detail about the kind of place England may be in the future, but they tell us little or nothing about the implications of change for the provision of ecosystem services. In order for this work to be made more applicable to current needs, such scenarios would need to be subject to a process of 'ecosystem proofing'.

The second ideal type refers to what we term *Ecosystem 'strong' but England 'weak' Scenarios.* This is the flip-side of the first ideal type. It concerns exercises that are wholly or closely connected with examining the changes that take place in ecosystems, but ones that are only loosely related to national expression. Examples of this type of work include the global scenarios of the MA itself and the *Land-use scenarios for Europe* by the EEA (2007). These are bodies of work, where the geographical reach is wide, but whose implications for England tend to be

Table 3.4: Existing Scenario Work - Ideal Types

Scenario Type	Nature of study	Indicative example
Ecosystem 'weak', England 'strong'	Directly applied to England but not directly concerned with ecosystem change	*Rural Futures Project: Scenario Creation and Backcasting (Future Foundation/Defra, 2005)*
Ecosystem 'strong' England 'weak'	Directly concerned with ecosystem change but implications for England are unclear	*Scenarios for the Millennium Assessment (MA, 2005)*
Ecosystem 'strong' England 'strong'	Directly concerned with ecosystem change and applied to an English context.	*The Parrett Catchment: A case study to develop tools and methodologies to deliver an ecosystem-based approach (*Potschin et al., 2008) *Defra (2006) Alternative future scenarios for marine ecosystems*
Ecosystem 'weak' England 'weak'	Neither directly related to ecosystem change nor England in expression	*Energy Needs, Choices and Possibilities: Scenarios to 2050 (Shell, 2001)*

more uncertain. So again, this work is relevant to current requirements but in a different way. It approximates well with the issue of ecosystem goods and services but the spatial scale of expression is very broad in terms of communicating key messages at the national and sub-national scale. Scenarios would need to be subject to a process of 'England proofing' if they were to be made more applicable to current needs.

Alongside these two ideal types it is important to recognise bodies of work that may be considered *Ecosystem and England 'strong'*, that is, wholly or closely connected with examining changes that take place in ecosystems at the England scale. Work funded by Defra, such as Morris et al.'s (2005) *Agricultural Futures and Implications for the Environment* is indicative here, as are case study projects funded under the NESU research programme 2006-2007 to explore the application of the Ecosystems Approach such as Potschin et al.'s (2008) 'The Parrett Catchment case study' (Defra Project Code NR0111). However, the limits of this work are that insights are confined to either a particular geographical context or narrowly defined thematic area. The scenario work on the marine environment (Defra, 2006) 'Alternative future scenarios for marine ecosystems' also fits into this category', but does not explicitly link ecosystem functions, habitats or biodiversity with the outcomes for uses of the marine environment.

Fourth and finally, there are large bodies of scenario work that are *Ecosystem and England 'weak'*. These are scenarios that are invariably operating at the global or sub-global scale and led by narrowly prescribed issues which, though potentially relevant to changes in ecosystems and their services, are not explicitly interpreted as such. An example of this work would be the scenarios developed by Shell for energy (Shell, 2001) or those of the IPCC for climate change (http://www.ipcc.ch/). This

work is potentially highly relevant but it would need to be both ecosystem and England 'proofed' for it to meet current requirements. The danger here though, is that these scenarios are shaped by a single overriding issue, precisely the kind of logic that an ecosystem-based approach tries to avoid.

The analysis presented above suggests that the recent scenario studies undertaken in the UK and international arenas are of relevance to current needs but such exercises are variable in their sensitivity to units of analysis (i.e. 'Ecosystems') and geographical contexts (i.e. 'England'). Relying on these scenarios to meet existing requirements will demand that work is undertaken to 'proof' them for both these issues coupled with an evaluation of the extent to which their underlying assumptions are credible and their timeframes appropriate. The alternative to this approach would be to initiate a process that involves the creation of new scenarios in the context of an MA-style assessment or England. The case for this is made stronger when we consider that the process of *developing* scenarios is a proven way of fostering stakeholder understandings of how ecosystems services and human well being will be affected over time given different types of policy intervention. Relying on existing scenario work may not be enough to clarify these consequences. **Thus there is a strong argument in favour of initiating a formal scenario-building exercise within an England-MA framework and integrating terrestrial and marine aspects.**

Interest in the drivers of change and their relevance to natural resource systems has begun to emerge recently in Defra through the Land Use Project (Defra, undated b), which aims to develop a 2050 vision for land use by looking at trends and pressures through scenarios and models. The work will inform discussions about future land use and ways in which the multiple benefits arising from the use of land can be sustained. However, although the outputs from the Land Use Project will be valuable, it is likely given its specific objectives that tracing the impact of change on ecosystem services through to full valuations and the design of policy responses will not be possible within the scope of the initiative. Since the 'model-MA' places particular emphasis on understanding the direct and indirect drivers and uses them both to identify the historical trends in ecosystem services, current states, and prospective trajectories under a range of plausible future scenarios, it clearly provides a framework in which the outputs of initiatives like the one dealing with land use could be considered, developed and linked with other work in this area. **Thus one function of an 'England MA-style assessment' might be as an integrating framework for scenario development.** This, we suggest, may be particularly important given the under representation of work exploring the drivers of change and potential future trajectories in Defra's *Action Plan*.

The importance of scenarios in designing potential response options was confirmed by those consulted as part of this project. Although it was recognised that a number of organisations were now involved it developing scenarios and of producing 'future visions' that were based upon them, it was agreed by many that still further work was necessary. It was also agreed that any national assessment exercise should draw upon existing scenario studies, so that it could develop and build on current thinking. However, several of the organisations consulted identified a particularly important, additional role that such an exercise might have. A key message that emerged from the discussions was that the process of conducting an MA-style assessment for England would need to be sensitive to scale. Different scales produce different types of information, it was suggested, and potentially, a "national" assessment should attempt to show how these

different levels link up. In relation to any requirement for scenario studies that might form part of such an assessment exercise, it was suggested that "... we need scenarios that operate at a range of scales" and that we need to find ways of "downscaling from the global through national and local". As one consultee put it:

> "If you wanted to get it down to a level which would really influence the decisions, you're going down to the local decision making level where you might want to try and demonstrate best practice, to identify what are the true values of ecosystem services".

Such comments echo those relating to the potential benefits of better coordination and integration that a national assessment exercise might bring. Not only should such initiatives try to help people think across different sectors – most consultees felt that it should also encourage them to take on board scale issues. Our general review suggests that for scenario studies to be useful in helping decision makes frame responses they have to be focused, relevant and well designed. **Part of the case for a national assessment could therefore rest on the fact that it would provide an arena in which the many different strands of thinking represented by different scenario studies could be brought together and refined so that they could be used more effectively at different spatial scales.**

3.2.8 Institutional Change

In its *Action Plan* Defra notes that embedding an Ecosystems Approach in monitoring, management and policy may well require institutional adaptations because of the emphasis it places on dealing with cross-cutting issues and drivers, and on developing integrated responses. Although the Plan is valuable in crystallising many of these issues, the needs to develop more holistic approaches to the resolution of problems at the environment-society interface have also bee promoted through other initiatives. In the UK we can, perhaps, see this type of process taking place in new frameworks being developed for the protection and use of marine systems. For example, the Marine Bill White Paper aims to put in place a better system for delivering sustainable development of the marine and coastal environment, addressing both the use and protection of marine resources. Five key issues are covered: planning in the marine area; licensing activities and developments in the marine area; marine nature conservation; modernising marine fisheries management (in England, Wales and Northern Ireland); and a new Marine Management Organisation (MMO).

In the terrestrial sector similar kinds of change in 'institutional thinking' is taking place which would also require much closer attention to the issues surrounding the output of ecosystem goods and services. Many of these changes will be driven by the EU. They include:

- The 2008 health check on **CAP**; within which emerging environmental mandates under single farm payments and pillar II frameworks will be reviewed.
- The 2010 review of the **Birds and Habitat Directives**;
- The preparation of the **2013 financial perspectives**, covering CAP reform, and the budgets for cohesion and structural funds, research, environment and development;

- Discussions arising from the **Green Paper on market-based instruments for environment and related policy purposes**[28]**;**
- Implementation of the objectives of the **Water Framework Directive** by 2015; which requires that all Member States achieve good chemical and ecological status in their surface water bodies and groundwater;
- The development of policy for **adaptation to climate change**, following the UK Climate Change Bill, and the publication of the recent EU *Green Paper* on Climate Change; and,
- The UK and EU Soil Strategies.

While each of these developments are significant in their own right, in terms of embedding the Ecosystem Approach in decision making, there will be an emerging need for Defra look across them to determine what overall impact they are having on the delivery of ecosystem services in general. **Thus for the terrestrial environment, investment in an MA-type assessment may provide a framework in which such a co-ordinated view might be developed. As noted above, although there are mechanisms for monitoring status and trends of marine ecosystems, these are not currently focussed on ecosystem services. A national assessment exercise may also help stimulate developments in this area also.**

The contribution that a national MA-style assessment might make, in terms of helping promote or embed the Ecosystem Approach, was an issue that we explored in our consultation work. An interesting and widely supported view that emerged was that in looking at the arguments for and against, it is useful to distinguish between issues of 'process' and 'content', and not overlook the importance of the former. One set of feedback from the workshop suggested, for example:

> "There is a distinction between a process case and a content case. An assessment can deliver content. It can deliver information, which wider stakeholders and customers could "consume". But there is also another issue about the process of conducting an assessment. It is actually an interesting process in itself. So regardless of what the outcome is, the actual process of conducting the assessment would be an interesting thing to do. It would allow participants to explore cross-sectoral synergies. It would allow people to get in the same room together. So if we're thinking about a case for an MA-type assessment you could argue that it's not just about the content you produce. It's not just about the product. It's about the process of conducting it."

These views build on the earlier comments we have highlighted on the need for integration of approaches and analysis, but in a sense go further, in that they recognise that the initiation of an national assessment exercise would be motivated by goals that go beyond simply the attempt to establish a more 'coherent' or 'robust' evidence base.

In fact, the aim of transforming existing approaches to decision making was an important part of the Global assessment, as the criteria used to review its success one year on from publication reveal (see Table 2.1). Reid (2006) looked, for example, for evidence that it has stimulated new policy approaches or programmes, or that it had led to changes in the priorities, reporting processes and the design of monitoring systems supported by governments, their agencies and the NGO sector.

[28] http://ec.europa.eu/taxation_customs/article_3849_en.htm

The extent to which an MA-style assessment for England would lead to similar changes in institutional relationships and approaches would clearly depend on how it was designed and led. These are issues that must be considered at a later stage. The important conclusion that emerges from this review is that there is a general agreement across a wide body of opinion that more integrated approaches to policies linking environment and people are required, and that the potential contribution that a national assessment exercise might make in achieving this aim should be considered.

3.3 Conclusion

The material presented in Part 2 of this report suggested that there was a clear requirement for the types of evidence that a national MA-style assessment might provide. We argued that such a conclusion did not by itself justify the need for a national assessment – if other initiatives and programmes were likely to fulfil these requirements.

The additional material reviewed in Part 3 suggests that despite the widespread and growing interest in the links between ecosystem services and human well-being, and the monitoring and reporting activities that these have engendered, a number issues emerge which could be addressed through an appropriately designed national assessment exercise.

Our review suggests, for example, that while much current work acknowledges the need and value of ecosystem assessment, the various parts do not yet add up to a whole. There is still separation of efforts across sectors (the split between the terrestrial and marine is especially evident) and difference in assessment approaches in relation to spatial and temporal scales. As a result it is difficult to see how decision makers might be encouraged to take account of ecosystem services despite the encouragement of those who might promote an 'Ecosystems Approach'. Something like a national assessment therefore appears to be the next logical step for a process that is currently sprawling in various directions, if only to ensure that those in Government and its agencies are able to summarise and communicate the current situation effectively.

Our review of the global assessment, and the way existing sub-global assessments are viewed within this model structure, suggests that the MA-type framework is a process that is capable of linking together different forms of inquiry. Our work suggests that neither at the England or UK level, can one plausibly say that this has happened yet as a result of existing initiatives. Nor, it seems, is this likely to be achieved in the near future.

We suggest therefore that on the basis of the review that we have made there is a *prima facie* case for a national assessment of some kind. Any final recommendation, of course, will depend upon whether such an exercise could be designed and implemented in a cost-effective and timely way. Thus in the final part of our Report we consider these more practical and procedural issues.

Part 4: Assessment options

Key messages:

Assessment options are the product of choices regarding thematic scope (the number of policy issues the assessment process addresses) and empirical detail (the resolution at which assessment outputs are compiled and presented).

Four generic design options are identified reflecting the mix of these issues:

- A cross-sectoral, single level assessment termed "*broad and shallow*"
- A targeted, multi-level assessment termed "*narrow and deep*"
- A targeted, single level assessment termed "*narrow and shallow*"
- A cross-sectoral, multi-level assessment termed "*broad and deep*"

All of these options have variants depending on the geographical coverage of the assessment, that is, whether the assessment is UK wide or more focused.

One of the ways in which assessment can overcome the limitations associated with a particular approach is to combine them with others to form an *assessment pathway*.

The most logical aspiration for assessment would be to initiate a process that moves from a broad and shallow to narrow and deep form of assessment, ideally at the UK level.

Such an approach to assessment requires less initial investment by sponsors and stands the best chance of embedding the Ecosystem Approach in to different levels and structures of decision making.

4.1 Scoping an MA-style Assessment

We have argued that there is a case to be made for some kind of MA-style assessment for England. We have, however, qualified that assertion by suggesting that any final decision must take account of whether the design of such an exercise was a cost-effective and likely to achieve the key aims that might be identified for it. Our review suggests there are three:

(i) ***a means of better understanding the links between ecosystems, human well-being and decision making.*** There is a case to be made that an MA-style assessment for England would help consolidate and strengthen science-policy understandings of the links between ecosystems, human well-being and structures of decision making. While the empirical and methodological evidence base is recognised to be developing fast, and in many respects, internationally 'leading', our understanding of how these links function is considered still quite poor.

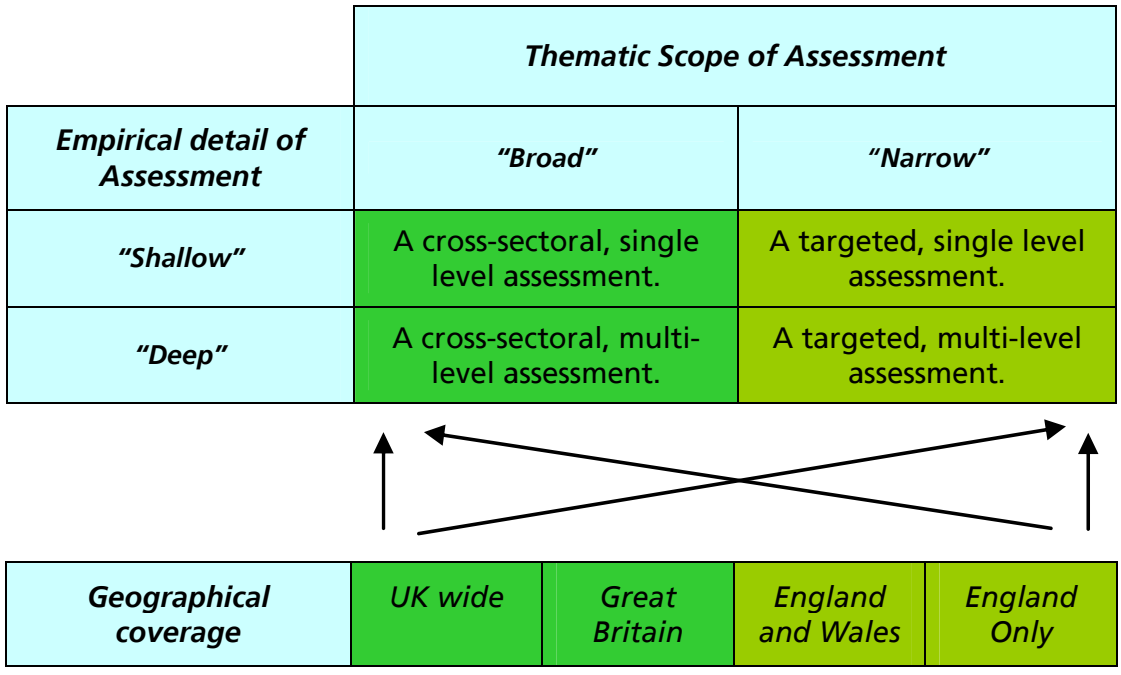
(ii) ***a way of developing a compelling story using existing evidence.*** There is a case to be made for an MA-style assessment for England on the basis that it would create a more coherent and powerful narrative about ecosystem services and human wellbeing than would otherwise be possible. The strength of an MA-style assessment would come from pulling existing information together in a more compelling way. It would therefore serve

an important communication function - both in terms of communicating priorities across government departments, and with society at large - and influence policy frameworks in ways that have not been yet realised.

(iii) ***a process in which different communities of interest would interact and co-learn***. There is a case to be made for an MA-style assessment for England on the basis that it would foster stakeholder interactions and learning in ways that would not be otherwise possible. The case for an MA-style assessment for England is not necessarily determined by the issue of creating new evidence or 're-engineering' existing information. The additionality of an MA-style assessment arises also in terms of the process that occurs in its name. The act of conducting an MA-style assessment for England has the potential to build capacity and understanding among diverse communities of interest and influence.

Clearly, there are many ways in which these objectives might be achieved, and in designing any initiative one must take account of where the emphasis between these objectives might lie. As a basis for discussion, we have, in Figure 4.1 below, suggested a framework for looking at the different design options that might be considered. The framework presents a different mix of what we term ***thematic scope*** (the number of policy issues the assessment process addresses) and ***empirical detail*** (the resolution at which assessment outputs are compiled and presented).

Figure 4.1: Possible options for an MA-style assessment for England



The axis for *thematic scope* distinguishes between design options that seek to address assessment as a cross cutting initiative considering a range of topic areas, (such as water, air, soil etc), in a highly integrated way (which we term "broad") and those that seek to be more targeted, focusing on a more limited number of priority policy areas, (such as, for example, water quality (which we term 'narrow'). The axis for *empirical detail* distinguishes between design options that are multi-scale in their reporting structure, producing insight at high levels of spatial resolution (which we term "deep"), and those that are single scale in their

reporting structure, producing insight in an aggregated or generalised way, (which we term 'shallow'). The mix of these two issues presents potential sponsors with the key parameters of assessment of which it is possible to distinguish between four quite different approaches to assessment: 'broad and deep'; 'broad and shallow'; 'narrow and deep' and 'shallow and narrow' respectively.

Before going any further it is worth recognizing two additional issues underlying these four options:

- **Geographical Coverage:** a fundamental choice will need to be made regarding the geographical coverage of the assessment process. In particular, the issue at stake here concerns how the assessment process would interpret the idea of 'national scale' reporting. For example, while the brief for this study asked us to consider the case for and against an MA-style assessment for *England,* many of those consulted, and particularly those concerned with the marine sector considered the England focus as being too narrow, and that the assessment should aim to bring evidence together for the UK as a whole. Notwithstanding that the UK government needs to meet many of its international and European commitments at the UK scale, ecosystems and theirs services do not respect legal jurisdictions. Moreover, even at the England scale, the national dependency and impact on the global flows of ecosystem services is an issue that must be considered. As a result, none of the four approaches outlined below preclude variations in the geographical coverage of the assessment although issues of coverage may impact on timing and costs.
- **Assessment pathways:** a second important issue is that while all of these approaches can be adopted as 'one-of 'assessment options, they are by no means mutually exclusive. Indeed, one of the ways we can overcome the limitations that are associated with adopting one approach alone is to combine them together to form different **assessment pathways**. We examine these assessment pathways in detail below.

4.1.1 Option 1 - a broad and shallow approach

A broad and shallow approach refers to an assessment process that is *cross-sectoral in scope but single level in its reporting style*. This approach is highly integrated in tone - exploring connections between a wide variety of themes - yet the emphasis of the assessment process is on producing "headline messages" at the macro scale; on creating a compelling and coherent narrative at the national level.

In practical terms, this approach is likely to rely heavily on expert panels extrapolating trends from existing data sets to generate its insight and insofar as this process would demand stakeholder engagement, it would tend to be focus on interactions between expert panels and national policy customers. A characteristic of this approach is that it would seek to build upon, and exploit, synergies with parallel initiatives. By drawing on existing sources of information a virtue of this option is that it would be perceived to 'add value' to the existing investments of resources for monitoring made at the national scale. So, for instance, a broad and shallow approach might build on partnerships already established by Defra through its membership of the Environmental Research Funders Forum, and specifically make use of the outputs of on-going initiatives such as Countryside Survey 2007, which is already part-sponsored by Defra. This survey includes plans to make an 'integrated assessment' of ecosystem services based on the analysis of

the field survey data. At present the outputs of this element of the work is not expected until 2010, and so there may be the opportunity to ensure that the reporting could form part of a wider national initiative, that might also include parallel but preliminary work for the marine sector that draws on outputs from the new monitoring initiatives that are now being put in place. In particular, the assessment could build on the work being done by UK Marine Monitoring and Assessment Strategy (UKMMAS) and coordinated with the timing of Charting Progress II (2010 and occurring every 5 years). The new Foresight[29] initiative on future land use could also inform the development of scenarios.

In operational terms, the broad and shallow option could involve the setting up of an independent review panel that could invite or take evidence across a broad range of issues, and have the resources to prepare a one-off or series of staged thematic reports targeted at different interest groups.

In structure, this approach to assessment conforms most closely to the global MA. Its key characteristic would therefore be that it is essentially an attempt to create a process through which information about ecosystem services might be assembled, rather than one that in which new monitoring systems might be designed and created. If, like a 'committee of enquiry', the panel driving the assessment could invite or commission the preparation of evidence from other organisations or groups over a reasonably long period, over say one year, then the expert plan would be able to reflect on information critically and present a reasoned assessment. These guidelines would help those willing to be involved to think about the types of data and evidence they should be collecting, and thus potentially initiate new patterns of working.

In terms of the three overall objectives of the assessment process identified, a broad and shallow assessment is likely to produce some telling, but in itself fairly generalised, insight into the links between ecosystems, human well-being and decision making. Because of its shallow design, stakeholder engagement would primarily involve national policy customers, some of whom would be unfamiliar with the MA process, but many with pre-existing investments. Engagement with wider communities of interest, such as state and civil society groups at the regional level, would tend to occur through the process of dissemination, and the consumption of assessment outputs. In essence this approach stands and falls on the assessment's ability to create a compelling story that wins hearts and minds. A broad and shallow approach is likely to report in *two-three years* depending on geographical approach, although because this process draws upon a diverse range of resources it may be that some kind of staged set of outputs would be inevitable since different sources would deliver outputs at different times (Table 4.1).

[29] http://www.foresight.gov.uk/Drumbeat/OurWork/ActiveProjects/LandUse/LandUse.asp

Table 4.1: Option 1 – a broad and shallow approach

	Option 1.1 Integrated, single level assessment- *UK wide*	**Option 1.2 Integrated, single level assessment - *England only***
Level of Detail	"Headline" national messages	"Headline" national messages
Likely outputs	"Light touch" multi-volume document with web interface.	"Light touch" multi-volume document with web interface.
Timescales	3 Years	2 years
Partners	*ERFF, NERC/CEH, UKMMAS, FORESIGHT, plus devolved administrations*	*ERFF, NERC/CEH, UKMMAS, FORESIGHT*
Possible reporting approach	Expert panels at the national level with endorsement from key policy stakeholders.	Expert panels at the national level with endorsement from key policy stakeholders.
A better understanding of the links between ecosystems, human well-being and decision making?	Yes – but a fairly generalised conceptualisation.	Yes – but a fairly generalised conceptualisation with some theoretical problems in focusing insight at the England level.
A process in which different communities of interest would interact and co-learn?	National outlook will strengthen collaboration and integration across devolved administrations.	Will consolidate learning among key policy customers but opportunities for collaboration and integration across devolved administrations would be missed.
A way of developing a compelling story using existing evidence?	Yes – high impact and widely disseminated. May appear general and insubstantial to some.	Yes – to a wide audience, but may appear general and insubstantial to some. England only focus could appear partial.
Linked assessment pathway	Could be the initial phase in a broad and deep process, one followed by narrow and deep studies. Alternatively could be "updated" with narrow and shallow assessments	Could be the initial phase in a broad and deep process, one followed by narrow and deep studies. Alternatively could be "updated" with narrow and shallow assessments

4.1.2 Option 2 – a narrow and deep approach

A narrow and deep approach is *a targeted, multilevel mode of assessment* and is the direct inversion of Option 1. Here the purpose of assessment is to produce new and novel insight around a limited set of themes, yet highly refined in terms of its empirical detail. Thus, while partnerships such as those established through the ERFF will be important, active involvement in new research initiatives, such as *Living with Environmental Change,* will be essential. A refocusing of some of Defra's own research funds might also be necessary. The essential and defining characteristic of this approach to assessment is to explore the complexions of a particular issue at different scales of resolution. It therefore presumes a process of multilevel stakeholder interaction and co-learning, one in which different scales of decision making come to shape final assessment outputs. Targeted forms of assessment could report in approximately *one and half to two years*.

A narrow and deep approach to assessment could be undertaken as a one-off option or as a cognate feature of an assessment pathway. As a stand-alone option, for instance, this approach could restrict its thematic coverage to the terrestrial environment alone, or focus on a tightly defined policy priority area, such as "water quality". In terms of the three overall objectives of the assessment process, an approach such as this would therefore produce some carefully delimited, but nonetheless very illuminating, insight into the links between ecosystems, human well-being and decision making, and implies that within the context of a given set of themes, stakeholder involvement would be extensive. However, the targeted nature of this process means that insight would by no means be comprehensive or complete, and may lack the overall impact of a broader approach. Moreover, in many respects, this option may be regarded as incongruous with the integrated nature of ecosystem assessment. For example, under an assessment model where the terrestrial and marine environments were decoupled, important insights into land-sea interfaces (such as the relationship between agriculture and water quality) would be lost to the process. In short, as a one-off option a narrow and deep focus would not do much to overcome the current, somewhat fragmented, nature of the evidence base described in Part 3 of this report.

An alternative, and arguably more reasonable, way of adopting the narrow and deep approach is to see it as the second stage in a linked process, in particular, one that exploited the impact of an initially broad and shallow form of assessment. Here, a narrow and deep approach would involve the targeted exemplification of issues highlighted in the initial assessment and would serve to take the process forward gradually, progressively involving a deeper and wider community of stakeholders. Arguably this targeted exemplification could follow a rolling cycle of "narrow and deep" reporting, ordered according to emerging policy priorities (Table 4.2)

Table 4.2: Option 2 – a narrow and d approach

	Option 2.1 Targeted, multi-level assessment - *UK wide*	**Option 2.2 Targeted, multi-level assessment - *England Only***
Level of Detail	High resolution and novel information	High resolution and novel information
Likely outputs	Detailed single volume document with synthesis report and web interface.	Detailed single volume document with synthesis report and web interface.
Timescales	Reports in two years	Reports in one and a half years
Partners s	*ERFF, NERC/CEH, LWEC, UKMMAS, FORESIGHT plus devolved administrations*	*ERFF, NERC/CEH, LWEC, UKMMAS, FORESIGHT*
Possible reporting approach	Nested hierarchy of assessment. Sub panels feeding into a national reporting framework.	Nested hierarchy of assessment. Sub panels feeding into a national reporting framework.
A better understanding of the links between ecosystems, human well-being and decision making?	Yes - great detail in tightly prescribed areas, but could miss the "bigger picture".	Yes - great detail in tightly prescribed areas, but could miss the "bigger picture". Some theoretical problems in focusing insight at the England level.
A process in which different communities of interest would interact and co-learn?	Extensive multi-level interaction - though participation would be restricted by theme. Would strengthen collaboration and integration across devolved administrations in specialist areas.	Extensive multi-level interaction - though participation would be restricted by theme. Opportunities to collaborate across devolved administrations would not exist.
A way of developing a compelling story using existing evidence?	Produces very well targeted messages for relevant stakeholders. Wider stakeholders may not engage with final message.	Produces very well targeted messages for relevant stakeholders. England only focus could appear partial
Linked assessment pathway	Could follow on from broad and shallow assessment as set of targeted case studies	Could follow on from broad and shallow assessment as set of targeted case studies

4.1.3 Option 3 - a narrow and shallow approach

The third option – narrow and shallow – is *a targeted, single level, approach to assessment*. The purpose of this option is to produce a simplified, national message around a limited number of issues or themes. Here insight would follow Option 1 in relying heavily on expert panels extrapolating trends from existing data sets, while stakeholder interest would tend to be fairly prescriptive and national in outlook. The same kinds of partnerships would also be required.

Again, the narrow and shallow approach to assessment can be used as a one-off option or as a cognate feature of an assessment pathway. As a 'one-off', the particular advantage of the narrow and shallow approach is that it would be the least demanding option of the four considered in terms of resourcing, but it is also the least comprehensive insight. It would produce some tightly delimited, and fairly generalised, information into the links between ecosystems, human well-being and decision making, but the targeted nature of the assessment process means that, like Option 2, insight would be far from complete. Again, many would regard this option as out of step with the integrated nature of ecosystem assessment. Because stakeholder engagement is weak when conducting assessment, the success of this approach turns ultimately on the way messages are communicated and received once the assessment process has been completed. The danger of this option is that assessment sponsors are left with the worst of both worlds: messages may appear simplistic to a specialised audience, whilst wider stakeholder audiences may fail to see the relevance of, or connections between, assessment insight and their own areas of professional responsibility. A narrow and shallow assessment could report in 6-12 months.

An alternative way of adopting the narrow and shallow approach is to again regard it as the second stage in a linked process, and in particular, one that periodically updates aspects of either a broad and shallow or narrow and deep form of assessment. Here, a narrow and shallow approach would serve to keep ecosystem assessment fresh in the mind of stakeholders, and again, could follow a rolling programme of reporting, ordered according to emerging policy priorities (see Table 4.3).

Table 4.3: Option 3 – a narrow and shallow approach

	Option 3.1 Targeted, single scale assessment - *UK wide*	**Option 3.2 Targeted, single scale assessment - *England only***
Level of Detail	"Headline" national messages	"Headline" national messages
Likely outputs	"Light touch" single volume document with web interface	"Light touch" single volume document with web interface
Timescales	Reports in nine months to a year	Reports in six to nine months
Partners	*ERFF, NERC/CEH, UKMMAS, FORESIGHT plus devolved administrations*	*ERFF, NERC/CEH, UKMMAS, FORESIGHT*
Possible reporting approach	Expert led process at the national level, like broad and shallow option only this time theme specific.	Expert led process at the national l evel, like broad and shallow option only this time theme specific.
A better understanding of the links between ecosystems, human well-being and decision making?	Could easily miss the "wider picture" in terms of integrated understandings.	Could easily miss the "wider picture" in terms of integrated understandings. Theoretical problems in focusing insight at the England level.
A process in which different communities of interest would interact and co-learn	Fairly weak and tightly proscribed opportunities for interaction and learning. Some new collaborations across devolved administrations could occur	Fairly weak and tightly proscribed opportunities for interaction and learning.
A way of developing a compelling story using existing evidence?	Yes - to limited audience, but likely to appear very general to specialists and irrelevant to non specialists	Yes - to limited audience, but likely to appear very general to specialists and irrelevant to non specialists
Linked assessment pathway	Wider exemplification and contextualisation will be key to using this option and therefore could follow on from broad and shallow or narrow and deep options	Wider exemplification and contextualisation will be key to using this option and therefore could follow on from broad and shallow or narrow and deep options

4.1.4 Option 4 – a broad and deep approach

The fourth and final approach - a broad and deep assessment - refers to a *cross-sectoral, multi-level process* and is the most comprehensive of the suite of options identified. The purpose of this approach is produce wide ranging and novel insight at varied scales of resolution: local, regional and national. In terms of the three overall objectives of the assessment process identified above, a broad and deep approach would create an authoritative and compelling narrative about ecosystem services, human well-being and decision making, and would do more than more than simply summarize the current evidence basis. Indeed, it would bring significant new insight to bear upon these links. Moreover, as a process, a broad and deep approach implies an assessment model whereby an extended community of interest actively interacts, engages and co-learns. This is because the process is like Option 1 - multi-thematic in scope, and like Option 2 in that it is reliant on a multi-level process of engagement. Thus partnerships such as those established through the ERFF will be essential. Moreover, active involvement in new research initiatives such as *Living with Environmental Change* will be necessary, supported by a refocusing of Defra's own research funds.

It is possible to envisage a broad and deep assessment as a one-off process, which we estimate would take approximately *five to six years report*, depending on the geographical scope of the process. This long lead time could be partly overcome by a staged reporting procedure, but issues of integration and comparison with other on-going initiatives would need to be carefully managed. In operational terms, it might be difficult to lead or commission work that some organisations thought overlapped with their area of concern or responsibility. It would require a strong management structure and expertise would be required to weave a wide range of information together. Detailed outputs would be summarized through a series of headline reports synthesising findings around cognate themes and localities. A particular issue that may arise is the additional reporting 'burdens' that this option would tend to place on organisations. Stakeholders working at the regional and local levels may therefore need to be convinced of the additionality of the process. There is danger too that, despite the comprehensiveness and robustness of the assessment, the process could do "too much, too quickly" in terms of empowering stakeholders. In fact, the detail of the process could be lost on wider groups, and paradoxically, its impact and legacy risks being relatively short-lived.

Given the complexity of structuring such an endeavour and the high costs associated with implementation we judge that it is far more logical to view a broad and deep assessment as the outcome of a linked and iterative process of assessment, initiated through a broad and shallow approach, and completed through a cycle of narrow and deep assessment. In other words, a broad and deep ecosystem vision would emerge by default rather than design.

Table 4.4: Option 4 – a broad and deep approach

Issues	Option 4.1 Integrated, multi-level assessment *UK wide*	Option 4.2 Integrated, multi-level assessment *England only*
Level of Detail	High resolution and novel information	High resolution and novel information
Likely outputs	Detailed multi-volume document with synthesis reports and web interface.	Detailed multi-volume document with synthesis reports and web interface.
Timescales	Reports in five to six years	Reports in four to five years
Partners	*ERFF, NERC/CEH, LWEC, UKMMAS, FORESIGHT plus devolved administrations*	*ERFF, NERC/CEH, LWEC, UKMMAS, FORESIGHT*
Possible reporting approach	Nested hierarchy of assessment. Sub-panels feeding into a national reporting framework. Panels could be theme or locality led.	Nested hierarchy of assessment. Sub panels feeding into a national reporting framework. Panels could be theme or locality led.
A better understanding of the links between ecosystems, human well-being and decision making?	Yes – provides insight to a high level of detail, going significantly beyond existing evidence base.	Yes – provides insight to a high level of detail going significantly beyond existing evidence. Insight of process problematical given the artificial boundaries set around assessment.
A process in which different communities of interest would interact and co-learn?	Yes, extensive, but could appear a burden to those engaged in the process. Could foster new models working based though many stakeholders will need convincing.	Yes, extensive, but could appear a burden to those engaged in the process. Many stakeholders will need convincing. Opportunities for collaboration between different national contexts missing. This may weaken overall impact of process on structures of decision making.
A way of developing a compelling story using existing evidence?	Yes, if synthesised well though risk that many stakeholders will get lost in the detail.	Yes, if synthesised well though risk that many stakeholders will get lost in the detail. England only focus could appear partial.
Linked assessment pathway	Broad and Deep approach could be viewed as the long term outcome of a process of assessment than included broad and shallow and narrow and deep elements.	Broad and Deep approach could be viewed as the long term outcome of a process of assessment than included broad and shallow and narrow and deep elements.

4.2 Evaluation of Options and a Recommendation

The four options outlined above are of course highly idealised, and would need considerable elaboration before they could be considered as a proper 'blue-print' for a national assessment. Nevertheless, they are sufficiently detailed to begin to answer the question about what form an 'appropriate' assessment might take, given the needs identified in Parts 2 and 3 of this report. They are also sufficiently well specified to begin to identify the sorts of benefit each design strategy might have compared to the 'option' of *doing nothing* – that is, of not undertaking a national MA-style assessment of any kind.

The consequences of the 'do nothing' option are perhaps most easily gauged by reviewing the current evidence base and how, given planned initiatives, it is likely to change in the future. As we have shown in Part 3, despite increasing interest in the issues surrounding ecosystem services, evidence is fragmented, and initiatives tend to be uncoordinated, and the links to human well-being difficult to make. Those consulted during this study confirmed that the lack of clear focus was a problem, both for those concerned with policy at national scales, and in terms of promoting more holistic styles of decision making through the ecosystems approach.

It is unlikely that the position in relation to evidence about ecosystem services is any different to that of environmental monitoring data more generally. The need for coordination of monitoring and research effort more generally is confirmed by the recent report to the Environmental Research Funders Forum (ERFF, 2007). The study recommended that not only should there be a close association between strategic planning for environmental monitoring, research and policy in environmental, but also that there is a clear vision, strategy and framework required if progress was to be made in the long-term. These recommendations have been accepted by the ERFF Board and now shape its future work programme.

The need for more joined-up decision making has also explicitly been recognised as a pre-requisite for achieving sustainable development in the UK, and a national assessment that followed the model of the global MA would clearly support such policies. More specifically, it is difficult to see how many of the goals set out in Defra's *Action Plan for Embedding the Ecosystems Approach* could be realised without the higher profile that a national assessment might give to these issues. Although the costs of the 'do nothing' option are difficult to specify, they are clearly those associated with the perceived short-comings of current sectoral styles of decision making that tend to separate environmental issues from questions of human well-being, overlook the economic and other values that ecosystems have for society, and fail to consider the wider impacts of development.

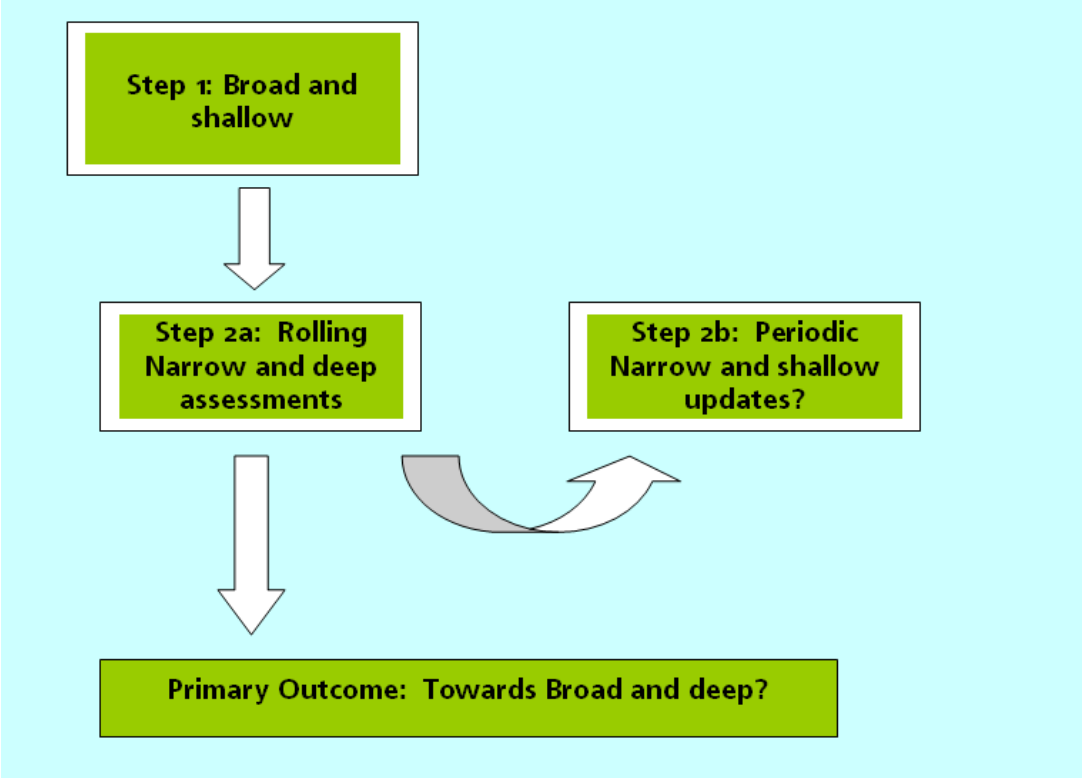
If we accept the case that 'something needs to be done' then what is the appropriate format for an assessment based loosely on the global MA model? In many respects none of the options represent perfect visions in themselves:

- *A **broad and deep** approach would be detailed and comprehensive but potentially cumbersome and expensive.*
- *A **broad and shallow** approach would be high profile, but its impact may be short lived*
- *A **narrow and deep** approach would be detailed and insightful but its appeal may be limited.*

- *A **narrow and shallow** approach would produce high profile targeted messages, but audiences for these may be limited, while their impact may be transitory.*

On balance, we conclude that initiating a process that moved from a broad and shallow to narrow and deep form of assessment would be a logical assessment aspiration for Defra (Figure 4.2).

Figure 4.2: An 'ideal' assessment pathway



This ideal pathway is initiated with a headline national assessment (2-3 years) and is followed by: i) more detailed work, such as sectoral assessments, taking place in 2 year waves and ii) periodic light touch "health-checks" taking place every 5 years and reporting in 12-18 months. Because a broad and shallow assessment is coupled by targeted forms of assessment, insight is progressively deepened.

The principle that lies behind out recommendation is that, once a shallow "headline" assessment of issues had been conducted and evaluated, assessment sponsors would look to foster more detailed 'sector-specific' forms of assessment. That is to say, the broad and shallow assessment process would be the stage upon which more refined (i.e. narrow and deep) assessments could then take place. Such assessments would be likely to take place on a rolling programme (we estimate on a approximately 5 year cycle) organised to reflect emerging policy priorities (such as water, air, soil, and so forth). These narrow and deep assessments could themselves be periodically updated through light touch "narrow and shallow" assessments. Nonetheless, the primary aspiration would be that assessment insight progressively deepens and broadens through the practice of staggered assessment. We estimate that this process of moving from the 'broad

and shallow' to the 'narrow and deep' would take about eight years. In a sense this pathway continues the process which the MA initiated. It is the most desirable of all approaches to assessment since it requires less initial investment and is about winning hearts and minds about the Ecosystems based approach on a gradual basis.

4.3 Costs for Carrying out an Assessment

4.3.1 Assumptions used for Cost Assessment

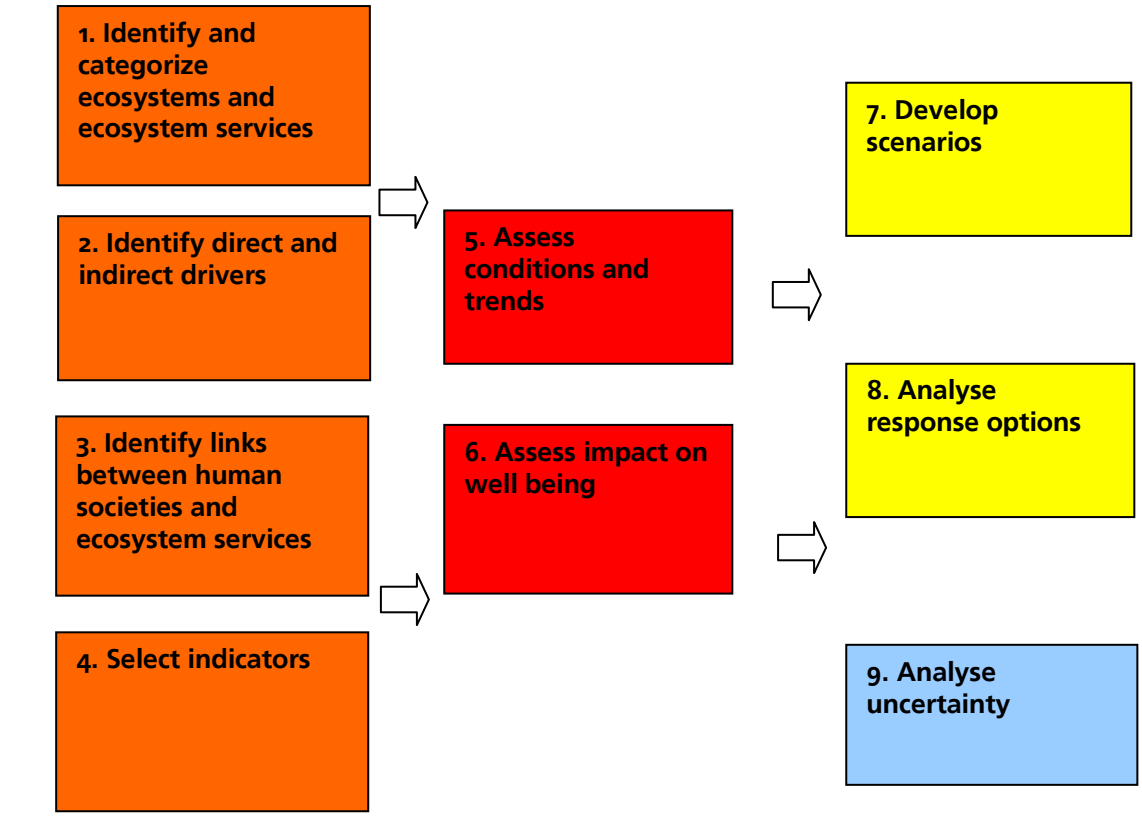
As the range of different options offered suggests, the cost of an undertaking an MA-style assessment is likely to vary considerably. However, approaches to assessment that follow the MA model share a number of common elements, that allow us to begin grasping underlining resourcing issues and where the burden of costing may lay. Moreover, all of the variants that we have identified also share some common characteristics so that the relative differences in funding required for each of them can more easily be identified. For example, all depend on the setting up of a coordinating group and rely on information from expert panels. These common elements and the costing options are perhaps best explained in relation to the elements of the 'MA-model' shown in Figure 4.3.

Although the detail will vary depending on which assessment option were chosen, all would require that a strong conceptual framework is established in which the different elements can be brought together. In terms of the general MA model, this kind of groundwork is largely represented by elements 1 to 4 (Figure 4.3) and would be put in place by a team coordinating the exercise, probably supported by expert briefings. Thus the costs of this preparatory or framing stage are likely to be similar for all of the options – although the breadth of the exercise may have an influence.

In terms of the MA-model, the main differences in costs between the options suggested above are largely controlled by how the other elements (6-9) are handled. All the options presented envisage that there would be an assessment of the conditions and trends of a suite of ecosystem services and an analysis of the impacts of these changes on human well-being. For the 'shallow' options, the evidence on which the assessments are based would largely be derived from existing information sources or existing sources re-analysed for the purposes of the exercise. Consequently these approaches would be inherently less resource demanding than the 'deeper' options, which are expected to involve the commissioning of new data or analysis. The important point to note, however, is that whatever assessment model is accepted elements 5 and 6 would ***have*** to be covered in some way – with the costs largely determined by the duration of the study, its breadth and its depth.

The remaining elements (7-9) of the MA-model are those which are desirable, but possibly less essential. While the development of a common set of scenarios might be valuable in terms of helping ensure coordinated policy responses, the formulation of detailed responses can probably be left up to the users of the assessment. Users will inevitably also take their own view of the uncertainties associated with the new evidence-base. Nevertheless, we recommend that some overview would be required in order to present and contextualise the headline messages, and like element 1-4 is probably most easily achieved through the work of some coordinating group. Once again, it is unlikely that the costs of this overview and reporting element would differ substantially between options, although the reporting ambitions are likely to influence costs to some extent.

Figure 4.3: Key elements of MA-model and their relationship to funding priorities



To summarise, the assumptions that we have made in drawing up our estimates of costs are that:

- **The assessment would be overseen and coordinated by an expert, dedicated team**. As the experience gained though both the MA itself and other assessment exercises such as the STERN report and the EU 'STERN-like Review of Biodiversity' suggests, strong leadership and well resourced scientific secretariat is essential to success.
- **The outcomes are shaped by expert input and peer review**. Again as the experience of other recent assessment exercises demonstrate, the quality and standing out the outputs is heavily dependent on the knowledge gained from the wider science and policy communities. Thus funding for the collection of such evidence is necessary in all the options considered.
- **The assessment is based on the development of partnerships** both in terms of being able to draw upon the outputs of existing initiatives, and to

commission new research. We have made the assumption that the amount of new research that Defra might fund is limited, and have suggested a sum that could be used to stimulate or trigger additional resources through new collaborations with partner organisations.

- **Outreach is essential.** That to ensure that the results of the assessment are taken up widely, and that the results change the way in which decisions are made, the final reporting stage must be well-funded and be supported by a clear communications strategy.

4.3.2 Cost estimates

An estimate of the costs of the four different options is provided in Table 4.5. The "Broad and Shallow" approach, which is our preferred option would cost about £520,000 and take about two years to complete. In comparison, the "Narrow but Shallow" option would cost around half this sum, while the "deeper" variants in excess of £900,000. Their costs depend heavily on the volume of new research commissioned, and the length of time period over which the assessment is conducted.

The estimates have been made on the basis of the broad assumptions outlined above, an England-only focus, and the following additional recommendations (see Table 4.5):

Component 1, Project Director: it is recommended at the study should be led by the Defra Chief Scientist, and so it is assumed that these costs can be absorbed.

Component 2, Desk Officer: a dedicated Desk Officer will be required within Defra and it is assumed that these costs will also be absorbed.

Component 3, Scientific Lead and Coordinator: it is recommended that an external senior researcher is appointed as lead scientist for the assessment. They will be responsible for managing the day to day aspects of the work, the drafting and editing of published output, and representation of the project at any meetings with partner organisations. It is assumed that the Scientific Lead would be a 40% appointment, which with organisational overheads at, say, Research Council levels would be around £40k per annum. Salary costs include employer's contributions.

Component 4, Scientific Secretariat: it is recommended that a scientific secretariat is required for the work, consisting of three post-doctoral researchers at an average salary cost of around £43k per researcher, and one Secretary/PA, at a salary cost of £35k/pa. At the same expected level of overheads assumed for Component 3, this would demand an expenditure of around £164k per annum. The Secretariat would manage the project website.

Component 5, Steering Committee: it is recommended that a steering committee consisting of Defra's key external partners be established, and that this should meet at least twice each year. The meetings may include the possibility of invited speakers to brief the Committee, which with resources for accommodation and room hire etc. would require support of around £2.5k per meeting.

Component 6, Expert Papers: commissioned expert input will be an essential element of any assessment and would serve in part as briefing material for the project team. It is assumed that the cost of an expert review will be

around £2k, and that the number of reviews will vary depending on the option pursued. Indicative numbers are suggested in Table 4.3.

Component 7, Stakeholder Consultations: it is recommended that the assessment should draw widely on stakeholder input, and that these meetings should be structured and deliberative, so that evidence can be reviewed critically. It is estimated that each meeting would cost around £5k, with facilitation, accommodation and travel. The numbers of such meetings will vary according to the option pursued.

Component 8, Peer Review: Peer review of final assessments and documents is essential; it is assumed that the costs of such reviews will be around £2k each, and that the number required will vary according to the option.

Component 9, Assessment Prospectus: since so much of the work of the assessment will depend on partnerships and external input of evidence it is essential that is the aims and objectives of the exercise are set out clearly, and the form of inputs be specified so that it is easily usable. It is also important to recruit other organisations to the exercise. This could be achieved by the creation and design of an assessment 'prospectus'. The work will be undertaken by the scientific secretariat, but some design input is

Table 4.5: Sample costing (£'000) of options (Assumes a one-off assessment at the England Scale)

	Component	*Broad and Shallow*	*Narrow and Deep*	*Narrow and Shallow*	*Broad and Deep*
	Assessment duration (years)	*2*	*2*	*1*	*5*
1	Appointment of assessment project lead (Defra)	*Absorbed Cost by Defra*	*Absorbed Cost by Defra*	*Absorbed Cost by Defra*	*Absorbed Cost by Defra*
2	Appointment of Desk Officer (Defra)	*Absorbed Cost by Defra*	*Absorbed Cost by Defra*	*Absorbed Cost by Defra*	*Absorbed Cost by Defra*
3	Appointment (40%) of co-ordinating scientific lead author over lifetime of assessment	80	80	40	200
4	Scientific Secretariate	328	328	164	820
5	Establishment of a steering committee over lifetime of assessment	*10*	*10*	*5*	*25*
	Commissioned expert papers - number	*10*	*10*	*5*	*20*
6	Commissioned expert papers - cost	20	20	10	40
7	Wider stakeholder contributions/consultations	30	20	10	25
8	Peer review of outputs by experts	5	5	1	25
9	Production of assessment prospectus	2	2	2	2
10	Production of final report (incl. design)	15	15	15	15
11	Launch, Dissemination and Communications Strategy	20	20	20	20
12	Comissioning of new research		400		1000
13	**Total Estimated Costs**	520	910	272	2192
	costs p/a	260	455	272	438

assumed and included in this component. The design should carry over to the project website.

Components 10 and 11, Production of Final Report and Launch: since dissemination of the outputs of the assessment is essential, resources have been allocated to the production of the final report and its launch. These costs are assumed to be similar for all the options considered.

Component 12, Commissioned Research: It is assumed that only for the "deep" options would there be a need to commission additional research, and so this element has only been included in the estimates for options 2 and 4. This element is the major unknown in the costing exercise. However, it has been assumed that any new, commissioned research would be funded in partnership with other organisations (ERFF or LWEC) and so the sums allocated are assumed to be only part of what may be required overall. It is assumed that a sum of around £200k per annum would be sufficient to stimulate the kinds of investment in new monitoring or analysis required, part of which could be allocated by redirecting some of Defra's existing research budget.

As noted above, all the cost estimates have been made on an England-only basis, because it is assumed that if a UK assessment were made, this would be done in partnership with the devolved administrations and that the costs for Scotland, Wales and Northern Ireland would be borne elsewhere.

4.4 Conclusions

We have argued that if the case for an MA-style assessment for England is accepted then a "Broad and Shallow" approach is recommended. This approach would be highly integrated in tone, exploring connections between a wide variety of themes. The emphasis of the process would be on producing "headline messages" at the macro scale and on creating a compelling and coherent narrative at the national level, designed to recruit new partners to the exercise. We recommend such an option because, if successful, it could set in place new ways of thinking about ecosystem services that would change the way people and organisations make decisions about them – thus embedding the Ecosystems Approach in a quite general way.

We estimate that the cost of such an exercise would be around £520k and that the exercise would take about 2 years to complete; 2009 would be an appropriate starting point given the timetables of other studies likely to provide information for it. By using the exercise as a platform to review and refine understandings of evidence gaps, new research could be commissioned or encouraged through the Environmental Research Funders Forum or LWEC initiatives, thus deepening the assessment approach in the long term.

Our cost estimates do not cover the resources needed for a UK level exercise. Although we strongly recommend that a UK study be done, the cost estimates presented here only cover that for England. It is assumed that the additional costs of the UK exercise would be met by the devolved administrations. Such an exercise would help Defra build on the partnerships and processes already put in place by the Environmental Research Funders Forum, but at the same time extend its approach by linking mainstream environmental science with economic and social valuation.

Part 5: Recommendations

We suggest that on the basis of the evidence reviewed here there is a strong case for undertaking an MA-style assessment for England, and we recommend that such an initiative be taken forward. The assessment would largely draw upon existing evidence or new evidence arising from current initiatives. It could start in 2009 and be completed within two years at a cost of around £520k.

We base our recommendation on the observations that:

- Current evidence and assessment of the state and trends of ecosystem services is fragmented and uncoordinated at the national scale, and that there are particularly strong arguments for better integration across the marine and terrestrial environments;
- It is unlikely that the ecosystems approach will ever be firmly embedded in decision making without such a high-profile exercise of the kind envisaged being undertaken; and,
- Such an exercise would assist in helping Defra meet its international reporting commitments, particularly in relation to proposed assessments at the European and Global scales.

Although the costs of "doing nothing" are difficult to estimate, it is clear that they are substantial. The barriers that a fragmented evidence base and 'siloed' approach to decision making have for effective decision making are issues that have been cited both in Defra's own *Action Plan*, and the UK Sustainable Development Strategy.

We further judge that, while we have focused primarily on the case for an MA-type assessment for England, there is a strong case undertaking a UK level study, and that an England-only initiative may provide a platform on which the development of such a national scale assessment exercise could be built. The type of assessment approach recommended here is consistent with Defra's approach to forming partnerships with a wide range of data provided and users through initiatives such as the Environmental Funders Forum (ERFF) and *Living with Environmental Change (LWEC).*

In terms of the partnerships that will need to be built in order to undertake an MA-style assessment, the mechanisms and processes already set in place through the EFF are a good starting point, and new research initiatives such as *LWEC,* offer the opportunity of extending the evidence base. **We recommend that these opportunities are best realised by:**

- **Placing leadership of the national assessment within the Defra Chief Scientist Group; and,**
- **Establishing a dedicated Scientific Secretariat, consisting of a part-time scientific lead, three researchers and other support staff.**

The dedicated scientific secretariat would enable new partnerships to the developed both within the UK and Europe, and ensure that independent, high-quality outputs that can be used by decision makers will be generated.

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Appendix 1:

Actions identified in Defra's Action Plan and their relationship to the Information Components of an MA-style exercise.

Key:

The actions[30] are numbered according to Annex 2 in Defra's *Action Plan* (Defra, 2007a), but reordered according to how they might draw upon information provided by different component of an MA-type exercise. The components of a supposed England MA (column "MA Element") are those depicted in Figure 1.1, and are numbered as follows:

(1) Identifying and categorising ecosystems and ecosystem services;

(2) Identifying links between human societies and ecosystem services;

(3) Identifying direct and indirect drivers;

(4) Selecting indicators;

(5) Assessing conditions and trends of ecosystems and their services;

(6) Assessing impacts on human well-being;

(7) Developing scenarios;

(8) Analysing response options; and

(9) Analysing uncertainty.

In addition to this categorisation, the response element (8) has been assessed according to whether it implies a research need (Res), would generate case study materials (CS) or directly inform policy development (PD). Rows in the Table have been shaded to indicate the broad groupings of actions.

		Action	MA Element	Comment
A	3	**Defra's** Land Use Project to explore the benefits of an ecosystems approach, drawing on lessons learned from land management projects where this approach is being applied	1, 2, 5,6	These actions assume a robust evidence base exists that can be used to identify the contribution that ecosystem services make to the well-being of people and their prosperity, and how management of services links to other and programmes. The evidence provided by a national MA-style assessment could therefore be used to frame policy measures and the creation of new cross-sectoral indicators.
	22	**Defra** to work with the **Department for Business, Enterprise and Regularity Reform** to ensure that the ecosystem services framework is given appropriate consideration in the development of environment-adjusted productivity indicators	1,2,4,5,8	
B	4 4a 4b 4c 4d	**Defra** to develop further case studies to demonstrate the benefits of an ecosystems approach in policy-making: ○ Scoping study on implementing an ecosystems approach to air quality policy on ammonia ○ Scoping analysis of the full range of benefits of Environmental Stewardship ○ in terms of impacts on ecosystem services ○ Development of a framework of action for management and restoration of peat soils based on the delivery of ecosystem services benefits	1,2,8CS	Case studies are a key component of the MA approach, and such work could, if designed appropriately, be used to extend the evidence base relating to the identification and provision of ecosystem services, the way they may be secured or restored though agri-environmental measures or other funding mechanisms. Such work could feed into a national MA process.

[30] **Notes:** Defra Action 31 has been omitted since this relates to the current scoping study.
Categories A-I are explained on page 13 of this document.

		Action	MA Element	Comment
	8	**Defra** to fund extension of England the Catchment Sensitive Farming Delivery Initiative through the CSR 07 cycle.	1, 2,8CS	
C	34	The **Department for International Development**, the **Natural Environment Research Council** and the **Economic and Social Research Council** to explore the links between healthy ecosystems and poverty alleviation and identify future research priorities through the joint 'Ecosystem Services and Poverty Alleviation' research programme	1,2,5,6,8Res	Defra and its partners have an interest in stimulating appropriate forms of research that explore the links between natural capital and livelihoods, so that effective policy responses can be designed and implemented. Such initiatives could contribute to the portfolio of work that made up a national MA.
D	25	**Defra** to ensure that, as part of implementing the England Biodiversity Strategy, effective action is taken to identify the ecosystems most vulnerable to climate change, and provide guidance for adaptation through managing for inevitable change	3,8,9	If the goals of the Action Plan are to be achieved, then work must be underpinned by a good understanding of the direct and indirect drivers that impact upon the delivery of ecosystem services. An MA-type exercise could contribute this kind of evidence at a range of spatial scales, and by continuation of the assessment provide the types of monitoring type data needed to determine the success of policies or management measures.
	11	The Environment Agency, Natural England and the Forestry Commission to work together with the **Government Offices** to ensure that environmental priorities are addressed in regional and sub-regional strategies/plans and their delivery, including by base-lining environmental pressures in each region	3,4,5,8	
E	37	**Defra** to contribute to a global study analysing the global economic benefit of biological diversity and the costs of the loss of biodiversity as part of the Potsdam Initiative agreed at the G8+5 Environment Ministers' meeting (i.e. Stern-type study for biodiversity and ecosystems services)	4,5,8	The development and use of indicators is a key component of the policy development and appraisal cycle. It is clear given the current objectives set in by the UK Sustainable Development Strategy, with its goal of living with environmental limits, that new metrics will be required to monitor the state and trends of key ecosystem services, and the costs and benefits of protection and restoration measures By requiring the uptake of development of new assessment and valuation tools, these actions are likely to result in responses that involve intuitional change as well as new policy measures. Thus an MA-exercise could be significant in terms of informing the design and implement indicator systems.
	15	**Defra**, the **Environment Agency, Natural England** and the **Forestry Commission** to pilot practical application of ecosystem services valuation in specific policy areas, including: ○ Valuation of the benefits from the implementation of the UK Biodiversity Action Plan ○ Impact assessment for the Marine Bill	4,6,8CS	
	21	**Defra,** the **Environment Agency, Natural England** and the **Forestry Commission** to develop a strategy for convergence between indicators and targets used in different policy areas to be consistent with an ecosystems approach	4,8	
	10	**Defra** to review existing policy and project appraisal tools to explore how the principles of an ecosystems approach, including the valuation of ecosystem services, could be incorporated	4,8Inst	

		Action	MA Element	Comment
	11	The **Environment Agency**, **Natural England** and the **Forestry Commission** to work together with the Government Offices to ensure that environmental priorities are addressed in regional and sub-regional strategies/plans and their delivery, including by base-lining environmental pressures in each region	4,5,6,8	
	21	**Defra** to work with the **Environment Agency, Natural England** and the **Forestry Commission** to develop a benefits transfer strategy for convergence between indicators and targets used in different policy areas to be consistent with an ecosystems approach	4,5,8	
F	15	**Defra**, the **Environment Agency**, **Natural England** and the **Forestry Commission** to pilot practical application of ecosystem services valuation in specific policy areas, including: o Development of a vision and action plan for the uplands environment based on the delivery of ecosystems benefits o Valuation of benefits from the England Woodland Grant Scheme	5,6,7,8PD	All of these types of actions depend upon the availability of timely and robust assessment information and analyses that traces the implications of changes for well-being and prosperity. Such information could be provided by an MA-exercise. In most cases (Actions 15, 16, 17, 30) the information is required to address specific policy needs, although in the case of Action 28, the value of simply making assessment information more generally available to decision makers is recognised.
	16	The **Department for Transport** to work with Defra on a long-term strategy for the development of environmental valuation in transport appraisal, including the valuation of ecosystem services	5,6,8PD	
	17	The **Department for Communities and Local Government** and Defra to work together to influence the design of eco-towns to maximise delivery of ecosystem services	5,6,8PD	
	30	**Defra** to assess the state of our seas and establish their quality status by June 2010 in order to provide a basis for marine ecosystem management (in compliance with the Marine Directive)	5,8PD	
	28	**Defra** and **Environmental Research Funders' Forum** to review ways of improving the integration of and access to publicly available evidence on the state of England's ecosystems and ecosystems services by the research community and decision-makers	5,8Res	
G	18	**Defra**, in partnership with the **Environment Agency, Natural England** and the **Forestry Commission** to develop a benefits transfer strategy for use in valuing ecosystem services	6,8	A key objective of the Ecosystems Approach is to ensure that the value of ecosystem services is full taken into account by decision

		Action	MA Element	Comment
	19	**Defra** to promote the development of the existing Environmental Valuation Reference Inventory (EVRI) database to ensure that it captures studies on the valuation of ecosystem services most useful and relevant for benefits transfer, including from Defra-funded studies	6,8,9	makers, thus studies that allow monetary values to be put on the benefits that ecosystems provide will become increasingly important. For benefit transfer techniques to be effective, information is required on the spatial and temporal variations in the output of ecosystem services the impacts of pressures upon them, and the uncertainties surrounding any valuation exercise.
	20	**Defra** to review work on non-economic and participatory valuation methodologies and produce guidelines on their use alongside economic valuation methodologies	6,8,9	
	18	**Defra**, in partnership with the **Environment Agency**, **Natural England** and the **Forestry Commission** to develop a benefits transfer strategy for use in valuing ecosystem services	6,8,9	
H	12	**Defra** to work with the **Government Office** network to build awareness of the benefits of an ecosystems approach in the English Regions	8	A key purpose of the global MA was to trigger appropriate policy responses to secure the output of ecosystem services. This is also a national-level objective for Defra. A national MA-initiative could provide the evidence base needed to ensure coherent responses we developed.
	26	**Defra** to ensure that the programme of response to the Climate Change, Bill Risk Assessment addresses the impacts of adaptation in other sectors on ecosystem health	8	
I	13	**Defra** to work with **local government** to build awareness of the benefits of an ecosystems approach at the local level, including identifying and disseminating examples of best practice	8Inst&CS	A further key purpose of the global MA was to trigger institutional change so as to ensure decision makers take the benefits that arise from ecosystems full into account in. This is a national-level objective for Defra also. A national MA-initiative could provide the evidence needed to support and promotes these changes, and to determine how effectively new institutional arrangements are working. Such an initiative would also be a way of communicating Defra's objectives to its partners.
	1	**Defra** to embed the principles of an ecosystems approach in its new standard policy-making procedures, which are being developed in the context of the Renew Defra programme	8Inst	
	2	**Defra** to embed key 'ecosystems approach' messages in its strategic communications on the natural environment	8Inst	
	6	**Defra** to embed the principles of an ecosystems approach in its new policy appraisal guidance for flood and coastal erosion risk management	8Inst	
	7	**Defra** to embed the principles of an ecosystems approach in its forthcoming Water Strategy	8Inst	
	9	**Defra** to work with **Natural England**, the **Environment Agency** and the **Forestry Commission** to explore how the principles of an ecosystems approach can be embedded in their corporate plans and strategies and to identify potential barriers	8Inst	

		Action	MA Element	Comment
	14	**Natural England** and the **Environment Agency** to consider how they can build their capacity at the local level to work with local authorities as local strategic partners	8Inst	
	23	**Defra** to ensure that principles of an ecosystems approach are reflected in the UK climate change adaptation framework	8Inst	
I	5	**Defra** to work with other Government Departments and the Devolved Administrations to introduce a new system of marine planning that embeds an ecosystems approach into marine management, and integrates effectively with other management processes in coastal areas.	6, 8PD	Implementation of the marine bill will involve addressing five key issues: planning in the marine area; licensing activities and developments in the marine area; marine nature conservation; modernising marine fisheries management and creation of a Marine Management Organisation. An evidence base of the type provided by a national MA could contribute towards decision-making within a marine planning system as it would provide information on ecosystem services that are easier to integrate into planning.
	24	**Research Councils** and other partners in the **Living With Environmental Change (LWEC) Programme** to work together to produce predictions of ecosystem impacts based on a range of climate change scenarios (such as those produced by UKCIP)	7,8Res	Case studies are a key component of the MA approach, and such work could, if designed appropriately, be used to extend the evidence base relating to the provision of ecosystem services. Ultimately these case studies and the research that underpins them could contribute to national scale policy responses. Given the limited funding and staff resources available to Defra, it is essential to work in partnership with other. Leadership of, or involvement in, a national MA exercise could benefit Defra by helping to identify its research needs and in communicating those needs to others. Involvement in national initiatives and programmes and would ensure that policy relevant research is undertaken, and that ultimately Defra's decision making is underpinned by the 'best science'.
	29	The **Environment Research Funders' Forum** to articulate monitoring requirements associated with an ecosystems approach and to propose a strategy for meeting these and in the Environmental Observation Framework high-level vision and plan	8Res	
	32	**Natural Environment Research Council** and the **Environmental and Social Research Council** to lead response of research councils to evidence needs through LWEC which will include a proposal for research on ecosystem services early in the programme	8Res	
	33	**Defra** the **research councils** and **Environmental Research Funders' Forum** to work in partnership to promote and co-ordinate relevant research and, in particular, to develop the role of Living With Environmental Change in this regard	8Res	
	33	**Defra**, the **research councils** and the **Environmental Funders' Forum** to work in partnership to promote and co-ordinate relevant research and, in particular, to develop the role of LWEC in this regard	8Res	

		Action	MA Element	Comment
	35	**Defra** to ensure that relevant research priorities are addressed in the influencing strategy for calls under the EU Research Framework Programme FP7 and, in due course, for the development of FP8	8Res	
	36	**Defra** to contribute to the forthcoming BioDIVERSA research call on ecosystem functioning and ecosystem services and to engage closely with this programme to ensure its outputs address current and future policy challenges	8Res	
I	30	**Defra** to assess the state of our seas and establish their quality status by 2010 in order to provide a basis for marine ecosystem management (in compliance with the Marine Directive)	1, 2, 3, 4, 5, 6, 9 (7?, 8?)	It is assumed that this refers to Charting Progress 2 and the OSPAR Quality Status Report (QSR) both due in 2010. The question here is the extent to which Charting Progress II will be based on an 'ecosystem approach'. A MA process may promote this but timing is tight. The plan for Charting Progress 2 is already underway, and it may be more feasible for Charting Progress 3, due in 2015.

Appendix 2

Review of Current initiatives and the types of evidence they are providing

Key

*= Defra Natural Environment Strategic Unit Phase I Study;

**= Defra Natural Environment Strategic Unit Phase II Study

The following are the eight broad requirements arising from Defra's Action Plan (Defra, 2007a):

1. Conceptualise and communicate its thinking about ecosystem services in a national context (Actions in Block A, Table 3.2);
2. Identify case studies that demonstrate the importance of managing ecosystem services in sustainable ways so that their importance can be appreciated by others (Block B and C);
3. Understand the direct and indirect drivers of change affecting ecosystem services and human well-being (Block D)
4. Understanding how information about ecosystem services can be used to design policy relevant indicators (Block E);
5. Have access to robust and timely information on the state and trends of ecosystem services (Block F);
6. Understand the values that can be attached to ecosystem services and how they vary from place to place and change as a result of the impact of direct and indirect drivers upon them (Block G);
7. Understand and promote new institutional arrangements that would achieve the integrated or holistic management of ecosystem services required by the ecosystems approach (Block H); and,
8. Contribute to the design and promotion of policy relevant research, and to gain access to the best science to support its decision making (Block I).

The # symbol denotes that the document is relevant to one or more of the needs.

Doc	Study	Comment	1	2	3	4	5	6	7	8
1	Inventory and assessment of natural resources (Defra Project Code NR0101)* Osborn et al. (2005)	○ There are few high quality, fully functional datasets that meet the needs of natural resources protection. ○ Awareness of ways in which data can be used beyond the primary purpose for which they were collected is sometimes poor. ○ Limited integration of information even where it exists.					#			
2	Defining and identifying environmental limits for sustainable development. (Defra Project Code NR0102)* Haines-Young, et al. (2006)	○ The capacity to identify environmental limits varies across different environmental domains. ○ There is a need to develop and integrate understandings of biophysical limits with information about they ways people value the ecosystem services and the risks and costs associated with maintaining or restoring them.		#	#	#				

Doc	Study	Comment	1	2	3	4	5	6	7	8
3	Valuing our natural environment (Defra Project Code NR0103)* Eftec (2006)	○ Valuation methods provide an explicit and transparent way of judging the importance of natural resources into decision making. ○ There are significant gaps in the evidence base related to valuation. ○ The development of improved tools for valuation and increased awareness of their use in decision making would be beneficial.				#		#		
4	Pressures on natural resources (Defra Project Code NR0104)* Atkins (2006)	○ Causal chain analysis (Topic maps) can be a useful tool for developing an understanding the links between pressures and the output of benefits ecosystem provide, and the ways in which different datasets can be used. ○ The evidence base supporting the use of these tools is limited in the area of natural resource management and protection.		#	#	#				
5	Framework analysis of natural environmental policy (Defra Project Code NR0105)* ADAS (2006)	○ ??								
6	The future of healthy ecosystems. (Defra Project Code SD0306) Raffaelli et al. (2004)	○ The concept of ecosystem health is a potentially useful one for assessing the capacity of ecosystems to generate ecosystem services. ○ Biophysical assessments do not capture the complexity of managed ecosystems with a significant societal component and so more holistic approaches are needed. ○ New tools are available but they need to be tested and refined.								
7	Future trends - work on horizon-scanning to identify future trends and pressures that will affect the natural environment and the policy framework (Defra Project Code SD0314) Merme et al. (2005)	○ A framework for developing cross-cutting scenarios linking change in the environmental, technological-scientific, socio-demographic, economic and political spheres. ○ Attempts to examine trends for a number of time steps up to 2050.			#		#			
8	Inventory study on natural environment data II. (Defra Project Code NR0106)** ADAS (2007)	○ An extension of the Inventory and assessment of natural resources study (Osborn et al. 2006) into the social and economic domain. ○ Despite a large number of potentially useful datasets, it is difficult to link them to specific policies and targets that deal with natural resource management and protection. ○ Data access may be a barrier to taking the ecosystems approach forward.					#			

Doc	Study	Comment	1	2	3	4	5	6	7	8
9	England's terrestrial ecosystem services and the rationale for an ecosystem approach (Defra Project Code NR0107)** Haines-Young and Potschin (2008)	○ The framework of the BAP Broad and Priority Habitats is a potentially useful one for looking at the state and trends of ecosystem services ○ Current monitoring data can be used to assess the state and trends of these habitats further work is required to identify the consequences for the output of ecosystem services. ○ Place-based assessments of ecosystem services provide a holistic and relevant decision-making framework.	#	#	#	#	#		#	#
10	Valuation of England's terrestrial ecosystem services (Defra Project Code NR0108)** Jacobs (2007)	○ The concept of 'Total Economic Value' (TEV) provides a good framework for valuing ecosystem services, but that the categories of services proposed in the MEA may need to be adapted. ○ Valuation is most tractable for provisioning services, and more difficult for the regulation and cultural groups. ○ The study is on-going at the time of preparing this report	#	#				#		
11	Thames gateway ecosystem services assessment using green grids and decision support tools for sustainability (Defra Project Code NR0109)** Collingwood Environmental Planning (2007)	○ Seeks to examine the appropriateness of the ecosystem services approach within existing land use planning frameworks and what kinds of decision support tools are needed to support it. ○ Network analysis and GIS mapping techniques provide a useful way of looking at interactions between land use and ecosystem services, but that their complexity for stakeholders may limit their application. The availability of data may also be a limitation. ○ The study is on-going at the time of preparing this report		#					#	
12	Case study to develop tools and methodologies to deliver an ecosystem approach – Heysham to M6 link. Draft Final Report (Defra Project Code NR0110)** ADAS (2008)	○ Focuses specifically on the relevance and role of the ecosystems approach in EIA. ○ Found that there is little awareness of ecosystem approach or the importance of ecosystem goods and services in the case study considered; as a consequence there was little use made of environmental valuation in the EIA exercise considered.		#					#	
13	The Parrett catchment. A case study to develop tools and methodologies for delivering an ecosystem approach (Defra Project Code NR0111)** Potschin et al. (2008)	○ Focuses on the extent to which ecosystems approach and the concept of ecosystem goods and services have been used implicitly in recent planning decisions and initiatives made at the catchment scale. ○ Found that explicit use of the ecosystems approach and scenarios describing the potential effect of decisions on ecosystem services may be helpful in local decision making, but that for successful implementation some support and guidance will be necessary.		#	#				#	

Doc	Study	Comment	1	2	3	4	5	6	7	8
14	Management of the Otmoor protected area (Oxfordshire). Draft Final Report, 83pp. (Defra Project Code NR0112)** McInnes et al. (2007)	??		#					#	
15	Outline of Defra Land Use Project, unpublished material, 2pp. Defra (Undated b)	○ Aims to develop a 2050 vision for land use by looking at trends and pressures through scenarios and models. ○ Seeks to inform discussions about future land use and ways in which the multiple benefits arising from the use of land can be sustained.			#	#				#
16	Evidence-to-policy workshop for one planet food and farming. Synopsis of lines of argument and evidence needs. Defra (2007c)	○ Deals with impact of markets, consumer attitudes and preferences on production systems, and responses of land managers. Also considered effectiveness of regulatory frameworks such as WFD. ○ Workshop outputs could be used to inform scenario development in relation to agricultural provisioning services and the other types of benefit farming systems can provide.						#		
17	Research Needs for UK Biodiversity. A summary of the important knowledge gaps, identified by the UK Biodiversity Research Advisory Group, 2003-2006 Ferris, R. (Ed) (2007).	○ Seeks to identify gaps in evidence base relating to biodiversity, including the role of biodiversity in generating ecosystem goods and services. ○ Identifies need to better understand links between process and output, the limits associated with ecosystem functioning, valuation methods and impacts of major drivers of change (esp. climate).	#	#	#	#		#	#	#
18	Marine Biodiversity and provisioning of Goods and Services: Identifying the research priorities. Unpublished Draft Paper for the UK Biodiversity Research Advisory Group (BRAG). Austin et al. (2007)	○ Extends UKBRAG assessment of evidence gaps in relation to the links between biodiversity and ecosystem services to the marine environment. ○ Identifies the understanding of biodiversity and ecosystem functioning, critical properties of ecosystems, quantification of goods and services and the implications of biodiversity change on goods and services as priority research areas.	#	#	#	#		#	#	#
19	GBSC/Royal Society MA workshop on MA follow up									
20	EPBRS on ecosystem service research									

Doc	Study	Comment	1	2	3	4	5	6	7	8
21	Environmental Capacity in the East of England. Draft Stage 1 and 2 Reports. Land Use Consultants and Cranfield University (2007a & b)	○ Examines concept of environmental capacity and finds that notions of environmental functionality, ecosystem and environmental service offer a way of operationalising the idea of capacity in strategic spatial planning. ○ Use of capacity concepts in spatial planning has, up to present, been theoretical rather than practical. Further methodological treatment of the concept is required. ○ Prefers term 'threshold' to 'limit' in discussions of capacity, but recognises that environmental and socio-economic constraints have to be set alongside each other in a transparent and robust way.	#	#	#	#	#			#
22	Natural England: State of the Environment report									
23	Upland ecosystem services and benefits: developing systems-maps, typologies and techniques for their quantification and mapping. Natural England Project number FST20/79/023 Haines-Young et al., 2008b	○ Seeks to develop an understanding of ecosystem services in the uplands and the pressures upon them by means of 'systems mapping', and to develop techniques for spatially mapping services. ○ Output will potentially feed into the uplands futures project, which is likely to make use of scenario building exercises as well as stakeholder consultation.	#	#	#	#		#	#	#
24	Natural England: Environment and Health Research Strategy									
25	Tracking Change in the Character of the English Landscape, 1999-2003. Haines-Young (2007)	○ An analysis of change in countryside character for two time period, 1990-1998, 1999-2003, which uses a range of existing monitoring and management uptake data at the scale of the Joint Character Areas of England. ○ Some aspects of character (e.g. habitat stock, condition and pattern) depend on the output of ecosystem services at the landscape scale. ○ Analytical framework may provide basis for exploring value of landscape or cultural services	#	#	#	#		**(#)**		#
26	The Uplands: Time to Change? RSPB (2007?)	○ Reviews state and trends of uplands and provides case studies on range of de facto services related to biodiversity characteristics. ○ Suggests vision	#	#					#	#

Doc	Study	Comment	1	2	3	4	5	6	7	8
27	A 50-year vision for wetlands: A future for England's water and wetland biodiversity English Nature, Environment Agency and RSPB (undated, 2006?)	○ Outlines process for creating vision for the wetlands, and the analysis of the benefits that these ecosystems provide is implicit in the approach (sees concept as 'wetland potential'); considers the need for expanding wetlands ~ useful as scenario element ○ Visions would benefit from scenario development as well as stakeholder involvement. ○ Emphasises need fro better data and modelling tools	#	#	#	#			#	#
28	Defra (Peat Project) (Stuart, undated)	○ Seeks to coordinate activities that will protect, and enhance peat soils through appropriate management and policy. ○ Identifies preliminary targets. ○ The initiative will identify knowledge gaps and seek to resolve them.	#							#
29	Summary of responses to the consultation on: A Sea Change A Marine Bill White Paper. Defra (2007d)	○ An analysis of responses to the proposed Marine Bill which suggests that there was generally widespread support for balancing economic and environmental objectives, but no specific mention of importance of ecosystem services (provisioning implicitly covered in context of fisheries). ○ There was also support for the integration of planning between land and sea, although the difficulty of coordination were emphasised. ○ It was suggested that more attention should be paid to the impacts of climate change. ○ Data availability was seen as a key limiting factor for success – with both data costs and the collection of primary data being an issue.	#						#	#
30	Charting Progress. An Integrated Assessment of the State of the UK Seas. Defra et al. (2005)	○ An integrated assessment if the state of the UK seas – emphasises the need to develop state and performance indicators. ○ Effective state indicators imply need to understand how changes in state impact on output of ecosystem services, but latter not explicitly considered. ○ Identifies gaps in knowledge base and lack of tools suggests need for stimulating further research.; better data and information stewardship needed, better mechanisms for knowledge transfer required.	#	#	#	#				#
31	Roadmap to Charting Progress 2. Defra (2008a)	○ Reviews options for second 'Charting Progress' exercise, potential time-line (until publication in 2010) and governance structure. ○ Could form input/stimulus to MA type exercise for the marine sector?								#

Doc	Study	Comment	1	2	3	4	5	6	7	8
32	Marine Biodiversity - The rationale for intervention. Building the evidence base for the Marine Bill. Frid and Paramor (2006)	○ This report seeks to identify the habitats and species which contribute most to the delivery of the ecosystem services provided by the UK marine environment. ○ Presents a typology of marine ecosystem services, the ecological groups/ecosystem components that underpin them. ○ Data availability and quality are variable on the various marine ecosystem components, but sufficient to make a representative assessment of the risk to the provision of important goods and services if there is a change to marine biodiversity. ○ There is evidence of decline in services due to human pressure – but review not comprehensive.	#		#					#
33	Developing Scenarios for a Network of Marine Protected Areas. Building the evidence base for the Marine Bill. Richardson et al. (2006)	○ Development of scenarios to explore benefits of different Marine Protection Area networks, designed according to a range of OSPAR-derived principals, including the protection of whole ecosystems to guide site selection. ○ Ecosystem services not explicitly included in analysis although consequences of scenarios upon them could be considered.								#
34	Marine Species Protection: A review of risk and considerations for improvement. Building the evidence base for the Marine Bill (Defra Project Code: WC04027) Hemingway et al. (2006)	○ Seeks to identify the risks associated with marine species not currently afforded protection, and for those vulnerable to human activities what approaches to protection might be appropriate.								#
35	Cost Impact of Marine Biodiversity Policies on Business – The Marine Bill. (Defra Project Code: CRO378) ABP Marine Environment Research Ltd. et al. (2007)	○ Analysis of costs to business of implementing the Marine Bill in the UK, using a hypothetical protected sites network for contracting management approaches. ○ Ecosystem services not considered explicitly – but cost estimates could contribute to a valuation study (see SAC and University of Liverpool, 2007).						#	#	#
36	The Marine Bill – Marine Nature Conservation Proposals – Valuing the Benefits (Defra Project Code: CRO380) SAC and University of Liverpool (2007)	○ Analysis of benefits arising from implementing the Marine Bill in the UK, using a hypothetical protected sites network for contracting management approaches. ○ Includes consideration of ecosystem services, and both on-site and off-site benefits. ○ Emphasises novelty of approach and lack of primary data - uses BT methods. Estimates could be refined through further work.	#					#	#	#

Doc	Study	Comment	1	2	3	4	5	6	7	8
37	Enforcement of marine nature conservation legislation: examining the scope for improvements. Building the evidence base for the Marine Bill (Defra Project Code: CRO347) Royal Haskoning (2006)	○ Examination of potential effectiveness of existing marine regulation enforcement procedures in relation to the requirements of the Marine Bill.							#	#
38	Marine Biodiversity. An economic Valuation. Building the evidence base for the Marine Bill. Beaumont et al. (2006)	○ Uses a TEV approach to value goods and services resulting from marine biodiversity ○ An estimate of TEV for marine ecosystems based on analysis of ecosystem service. ○ Estimates limited by lack of biophysical, economic and social data but preliminary figures can be suggested. ○ Data gaps on values for certain services e.g. resilience, bioremediation, option use and a lack of UK case studies ○ Emphasises severe deficiency of case studies and recommends further site-specific research.	#	#				#		#
39	Valuing Marine Protected Areas for the UK, An economic study focusing on leisure and recreation, including a Strangford Lough case study WWF (2007)	○ Provides a review of current and potential ecosystem goods and services provided by MPAs in the UK; ○ Provides a case study for the Marine Nature Reserve (MNR) Strangford Lough and the values of the goods and services		#				#		
40	England's Ecosystem Services: a preliminary assessment of three habitat types Natural England (2006)	○ Provides a detailed catalogue of ecosystem services for three priority habitats (including inter-tidal/coastal habitats, broadleaf woodland & freshwater wetlands) ○ Provides examples and case studies of valuation work ○ Provides advice on valuation methods to assist decision making ○	#	#				#		
41	Research into the economic contribution of sea angling Drew Associates (Undated)	○ Provides a valuation of the contribution of sea angling to the economy ○ Illustrates potential impacts of a decline in ecosystem services related to angling (i.e. fish populations)			#			#		
42	Marine climate change impacts: Annual Report Cards 2006 & 2007-2008 MCCIP (2006 & 2007)	○ Provides an overview of what climate change is already happening in the marine environment and what could happen (together with the level of confidence for these predictions)			#		#			

Doc	Study	Comment	1	2	3	4	5	6	7	8
43	Alternative future scenarios for marine ecosystems Defra (2006) (Authors: J.K.Pinnegar, D.Viner, D.Hadley, S.Dye, M.Harris, F.Berkout and M. Simpson)	○ Provides predictions along different sectors for four scenarios: world markets, global commons, fortress Britain or local stewardship; ○ Under the scenarios predictions are given for climate & Hydrography; fisheries & aquaculture; tourism & leisure; coastal defence; ports & shipping; inputs & run-off; aggregate extraction; oil & gas and renewable energy and construction ○ The predictions therefore focus on ecosystem goods that are of direct value to humans	#		#					
44	Estimate of economic values of activities in proposed conservation zones in Lyme Bay. Report to the Wildlife Trusts. Homarus Ltd, 2007	○ Provides a valuation of scalloping dredging versus other non-destructive uses that would benefit from creation of a marine conservation zones. ○ Concludes that scallop dredging provides £162,000 to £182,000 in benefits whereas non-destructive uses amount to £509,000.		#						

Appendix 3:

Existing data, information and ecosystem monitoring and assessment processes in England mapped against the MA framework

A3.1: UK bird monitoring and assessment

Species/habitat	Monitoring and assessment output	Main source for results/ Key monitoring and assessment schemes	Utility of the processes within an MA type assessment for England
Birds	Trends in the breeding populations of common and widespread terrestrial birds	Breeding birds of the wider countryside (synthesis of several monitoring schemes presented as web based results) Breeding Bird Survey (web based results)	• Ecosystems (condition and trends)
	Trends in seabird breeding numbers and breeding success at key sites based on annual and tri-annual sampling since.	Seabird Monitoring Programme annual results (web publication)	• Ecosystems (condition and trends)
	Seabird population changes measured by comparing complete breeding population census in 1969-70, 1985-88, 1998-2002	Seabird 2000 census results and comparisons with Seabird colony register and operation seafarer censuses. Summary results and detail (web publication)	• Ecosystems (condition and trends)
	Annual, and periodic wintering population counts of geese and swans	Goose and Swan Monitoring Programme results (web publication)	• Ecosystems (condition and trends)
	Trends in wintering water bird numbers based on annual counts since 1960 for Wildfowl, 1969 for waders and additional species from 1980s.	The Wetland Bird Survey Alerts (web publication)	• Ecosystems (condition and trends)

A3.2: Analysis of pressures on UK bird populations

Pressure	Key messages from UK bird surveillance and monitoring	Key monitoring and assessment schemes	Utility of the processes within an MA type assessment for England
Over-exploitation	Status of most huntable bird species is good, with many showing long-term population increases. A small number of species are in decline, probably due to other pressures. Seabirds may provide an indirect indicator of fisheries exploitation; the status of most seabirds is good, with just a few	Wetland Bird Survey (BTO/WWT/RSPB/JNCC), Goose & Swan Monitoring Programme (WWT/JNCC), seabird-monitoring schemes (JNCC & partners).	• Ecosystems (condition and trends) • Drivers of change

Pressure	Key messages from UK bird surveillance and monitoring	Key monitoring and assessment schemes	Utility of the processes within an MA type assessment for England
	species showing long-term declines, suggesting that there have been no lasting negative impacts of over-fishing.		
Pollution	Species formerly impacted by pesticide use have recovered well and most other species have good status. There are concerns over several dispersed pollutants, but population-level impacts are difficult to detect. Phasing-out of lead shot in wetlands has benefited affected species.	SCARABBS national surveys (SCAs/RSPB), special surveys, Breeding Bird Survey (BTO/JNCC/RSPB), Predatory Bird Monitoring Scheme (CEH/JNCC/EA).	• Ecosystems condition and trends) • Drivers of change • Response options
Habitat loss	Historical declines of some specialist farmland species are significant. Most now show some recovery due to targeted management. Many common farmland and woodland birds have declined over last 30 years but this has slowed and the indicator has been stable since 1999. Farmland bird losses have been largely due to the intensification of farming affecting agricultural habitats. Most wetland species and seabirds have good population status.	SCARABBS national surveys (SCAs/RSPB), special surveys, Common Birds Census (BTO), Breeding Bird Survey (BTO/JNCC/RSPB).	• Ecosystems (condition and trends) • Drivers of change
Alien species	Most established non-native bird species are increasing, as are a few currently rare ones. Negative impacts on native species have been demonstrated, but impacts are generally unclear. Non-native mammals have caused significant local population declines in some birds.	Goose & Swan Monitoring Programme (WWT/JNCC), Wetland Bird Survey (BTO/WWT/RSPB/JNCC), Rare Breeding Birds Panel, special surveys, seabird-monitoring schemes (JNCC & partners).	• Ecosystems (condition and trends) • Drivers of change
Climate change	Changes in migration and breeding phenology evident in many species. Medium-term declines in some seabirds may be in response to climate change impacts on food availability. Redistribution of wintering waterbirds in UK demonstrated. Loss of breeding species from vulnerable habitats predicted, e.g. montane birds. Currently difficult to detect population-level changes due to	All existing surveillance and monitoring schemes.	• Ecosystems (condition and trends) • Drivers of change

Pressure	Key messages from UK bird surveillance and monitoring	Key monitoring and assessment schemes	Utility of the processes within an MA type assessment for England
	significance of other pressures.		

A3.3: UK butterfly surveillance

Species/habitat	Monitoring and Surveillance output	Main source for results/ Key monitoring and assessment schemes	Utility of the processes within an MA type assessment for England
Butterflies	Trends in populations of a range of widespread and specialist butterfly species based on annual samples since 1976	UK Butterfly Monitoring Scheme key findings (web based results)	• Ecosystems (condition and trends)

A3.4: Analysis of pressures on UK butterfly populations

Pressure	Key messages from UK butterfly surveillance and monitoring	Key monitoring and assessment schemes	Utility of the processes within an MA type assessment for England
Over-exploitation	UK butterflies are not subject to significant exploitation at present and there is no evidence of any species being adversely affected by over-exploitation. Those rare species whose populations might be endangered by any collecting are given full legal protection, while scarce species that might be damaged by commercial collecting can only be sold under licence.	Butterflies for the New Millennium (BC, CEH (BRC) & JNCC) UK Butterfly Monitoring Scheme (BC, CEH & JNCC).	• Ecosystems (condition and trends) • Drivers of change
Pollution	There are likely to be two principal pollution impacts upon UK butterflies. First, direct mortality from insecticides used for agriculture or forestry, second, the loss of food plants through use of herbicides or the application of fertilisers on farmland. Insecticide mortality is likely to be greatest for generalist butterflies in arable landscapes, where the few resident species may be adversely affected by spray drift into hedges and small habitat fragments alongside intensively managed fields. The impact on	Key schemes: Butterflies for the New Millennium (BC, CEH (BRC) & JNCC) UK Butterfly Monitoring Scheme (BC, CEH & JNCC).	• Ecosystems (condition and trends) • Drivers of change

Pressure	Key messages from UK butterfly surveillance and monitoring	Key monitoring and assessment schemes	Utility of the processes within an MA type assessment for England
	butterfly populations of losses resulting from insecticides remains unquantified. Of greater significance is likely to be the loss of larval food plants from meadows (as well as areas adjoining arable fields) through the application of herbicides and fertilisers. Both widespread and specialist butterflies that occupy grassland habitats have lost substantial numbers through the process of grassland "improvement" over the past century, but the size of these losses cannot readily be estimated.		
Habitat loss	Habitat loss and habitat change have been the major reasons for the decline in ranges and abundance for British butterflies. Both direct habitat loss and change, as well as declines operating through the fragmentation and isolation of habitat fragments have been important in Britain. These changes have impacted adversely upon both generalist and habitat specialist species in Britain. Habitat loss has been significant for grassland, heathland, woodland and wetland species, with habitat change also being particularly significant for grassland (changes in grazing and cutting regimes), heathland (loss of traditional management) and woodland (loss of coppicing management).	Butterflies for the New Millennium (BC, CEH (BRC) & JNCC) UK Butterfly Monitoring Scheme (BC, CEH & JNCC).	• Ecosystems (condition and trends) • Drivers of change

A3.5: UK mammal surveillance

Species/habitat	Monitoring and Surveillance output	Main source for results/ Key monitoring and assessment schemes	Utility of the processes within an MA type assessment for England

Species/habitat	Monitoring and Surveillance output	Main source for results/ Key monitoring and assessment schemes	Utility of the processes within an MA type assessment for England
Mammals	Trends in populations of a range of widespread and mainly common species based on annual samples from gamebag returns since 1961.	The National Gamebag Census and the NGC report: Participation of the National Gamebag Census in the Mammal Surveillance Network	• Ecosystems (condition and trends)
	Trends in populations of a range of widespread and common species, based on annual samples since 1995.	The Breeding Bird Survey and the Breeding Bird Survey latest report BTO Research Report No. 428. The production of population trends for the UK mammals using BBS mammal data: 1995-2004	• Ecosystems (condition and trends)
	Trends in the populations of a range of bat species based on annual samples since 1997	The National Bat Monitoring Programme detailed results plus the NBMP full report The National Bat Monitoring Programme: Annual Report 2004 and summary report on the State of the UK's Bats	• Ecosystems (conditions and trends)
	Trends in populations of a dormice based on annual nestbox counts in woodlands in England and Wales.	The National Dormouse Monitoring programme and Dormouse monitor with includes results.	• Ecosystems (conditions and trends)
	Detailed summary of results from all mammal schemes with historic and current (since 1995) trends.	JNCC/TMP report on UK Mammals, Species Status and Population Trends	• Ecosystems (condition and trends)

A3.6: Analysis of pressures on UK mammal populations

Pressure	Key messages from UK mammal surveillance	Key monitoring and assessment schemes	Utility of the processes within an MA type assessment for England
Over-exploitation	Over exploitation has affected some mammal species historically, particularly the persecution of many carnivores such as otter and polecat and baiting of badgers. Legislative protection measures have had a significant effect and	National Gamebag Census, Breeding Bird Survey, British Deer Society surveys	• Ecosystems (condition and trends) • Drivers of change • Analysis of response options

Pressure	Key messages from UK mammal surveillance	Key monitoring and assessment schemes	Utility of the processes within an MA type assessment for England
	populations of all those species are now increasing. There are no signs of over-exploitation of game species such as deer, brown hare or mountain hare.		
Pollution	There are signs that effects of pollution have ameliorated. Improvements in water quality across the UK have contributed to the return of otters to many waterways. Bat species appear to be doing well with a reduction in the use of toxic timber treatment and other pesticide use.	National Bat Monitoring Programme, National Otter Surveys.	• Ecosystems (condition and trends) • Drivers of change • Analysis of response options
Habitat loss	Historical declines of many species can be attributed in part to habitat loss. Loss of habitat condition still impacting on some species such as dormouse, hedgehog and probably water vole, but others, such as bats showing stable or increasing populations. There is not sufficient information to determine of habitat loss is affecting populations of small mammal species likely to be sensitive to this pressure, for example voles, shrews and mice.	Key schemes: National Bat Monitoring Programme, National Dormouse Monitoring Programme, Mammals on Roads	• Ecosystems (condition and trends) • Drivers of change
Alien species	There are significant increases in populations of non-native species that are having impacts on native fauna and flora, such as grey squirrel on red squirrel, Sika deer on red deer and muntjac on woodlands. Significant declines in rabbit populations may be good news for some vulnerable habitats, and declines in mink may help water vole and ground nesting bird populations. Unfortunately we have little information on over 40% of non-native species (mainly small mammals including island subspecies).	National Gamebag Census, Breeding Bird Survey, Mammals on Roads	• Ecosystems (condition and trends) • Drivers of change
Climate change	There are no obvious impacts, although there are indications that increasing lesser horseshoe	National Bat Monitoring Programme, National	• Ecosystems (condition and trends)

Pressure	Key messages from UK mammal surveillance	Key monitoring and assessment schemes	Utility of the processes within an MA type assessment for England
	and possibly greater horseshoe populations may be due to increases in mean annual temperatures. Dormouse populations are also possibly affected by climate change.	Dormouse Monitoring Programme	• Drivers of change

A3.7: UK plant surveillance

Species/habitat	Monitoring and Surveillance output	Main source for results/ Key monitoring and assessment schemes	Utility of the processes within an MA type assessment for England
Plants	Relative changes in distribution for the majority of vascular plant species between 1958-1998	Presentation of the survey results and relative change calculations - New Atlas of British and Irish Flora (publication) Analysis of factors influencing the changes - Changing Flora of the UK (web publication)	• Ecosystems (condition and trends)
	Relative changes in distribution for 860 vascular plant species between 1987-2004.	Change in the British Flora 1987-2004 (publication)	• Ecosystems (condition and trends)
	Changes in plant abundance within stratified sample plots with the Countryside Surveys of 1990 and 1998	Countryside Survey results and analysis of the plant results National-scale vegetation change across Britain; an analysis of sample-based surveillance data from the Countryside Surveys of 1990 and 1998 (Journal Article)	• Ecosystems (condition and trends)
	Changes in abundance for 65 widespread plant species based on annual sampling since	Common Plant Survey	• Ecosystems (condition and trends)

A3.8: Pressures on UK plant populations

Pressure	Key messages from UK plant surveillance and monitoring	Key monitoring and assessment schemes	Utility of the processes within an MA type assessment for England
Over-exploitation	Most information relates to isolated incidents of exploitation, and there is no clear evidence linking these incidents to overall trends. Concerns have been expressed regarding the commercial collection of bluebell bulbs, mosses for hanging baskets, wild mushrooms for the restaurant trade, and medicinal plants and fungi. Wild	BSBI Atlases, BSBI Local Change, Common Plants Survey (Plantlife), Countryside Survey.	• Ecosystems (condition and trends) • Drivers of change

Pressure	Key messages from UK plant surveillance and monitoring	Key monitoring and assessment schemes	Utility of the processes within an MA type assessment for England
	harvesting of plant and fungal material appears to be increasing, and sustainability protocols are being developed where possible. No surveillance or monitoring schemes are picking up a signal from this pressure.		
Pollution	Eutrophication is identified as a major cause of floristic change in all surveys, at all scales. There is no indication that this trend is slowing. The signal appears particularly strong in grasslands, inland rock and wetland habitats. In wetlands, eutrophication may be the main driving force affecting change, whilst in grasslands grazing impacts are also driving change. Epiphytic lichen communities are often proposed as a means of measuring the impacts of air pollution, but there is no current nationwide survey.	BSBI Atlases, BSBI Local Change, Common Plants Survey (Plantlife), Countryside Survey.	• Ecosystems (condition and trends) • Drivers of change
Habitat loss	The impact of habitat loss in the period 1930-1999 on plant species is very marked. Many grassland, heathland and wetland species declined over this period, with habitat loss as the main driver. More recently, these declines may have slowed. The 1987-2004 tetrad surveys detected few changes due to habitat loss (although for some species it was significant). However, it was noted that habitat loss was poorly covered by these surveys, as species are often able to survive for extended periods in small populations in remaining fragments of the habitat. The eventual impact of this fragmentation remains unknown. Habitat transformation through either undergrazing (particularly prevalent in the lowlands) or	BSBI Atlases, BSBI Local Change, Countryside Survey.	• Ecosystems (condition and trends) • Drivers of change

Pressure	Key messages from UK plant surveillance and monitoring	Key monitoring and assessment schemes	Utility of the processes within an MA type assessment for England
	overgrazing (in the uplands) is noted as a major driver of change in grassland and upland habitats. Countryside Survey continues to report some change due to habitat loss.		
Alien species	Non-native vascular plants are divided into archaeophytes (established in the wild before 1500) and neophytes (established in the wild since 1500). Historically, archaeophytes have undergone very marked declines, particularly associated with agricultural intensification. The vast majority of neophytes are stable or increasing, with a strong correlation between rapid increase in range and recent introduction date. Most non-native vascular plants compete on equal terms with native species and are largely unproblematic, only a few species are so competitive as to threaten native plant communities. There is also clear evidence of spread of non-native bryophytes. Non-native plant pathogens and mammals (particularly grey squirrel and muntjac) are also having a significant impact on plant species.	BSBI Atlases, BSBI Local Change.	• Ecosystems (condition and trends) • Drivers of change
Climate change	Climate change is currently leading to increases in some species, in particular short-lived pioneer species found in urban habitats or on roadsides. Southerly species as a group are outperforming more northerly species in grassland habitats. Presently, climate change cannot be shown to be leading to declines, but this may be due to the great persistence of upland plants even when facing unfavourable conditions. Phenological changes are also apparent, but the long-term	BSBI Local Change, UK Phenology Network (Wild Flower Society)	• Ecosystems (condition and trends) • Drivers of change

Pressure	Key messages from UK plant surveillance and monitoring	Key monitoring and assessment schemes	Utility of the processes within an MA type assessment for England
	impact of these changes is unclear.		

A3.9: UK habitat surveillance

Species/habitat	Monitoring and Surveillance output	Main source for results/ Key monitoring and assessment schemes	Utility of the processes within an MA type assessment for England
Habitats	Changes in the stock and condition of broad habitats and landscape features from field mapping and vegetation plots in stratified random sample of 1km squares first made in 1978, and repeated in 1990, 1998, 2000, 2007.	The Countryside Survey has produced a range of results from habitat stock to more detailed vegetation and plant species analyses. (web publications and downloads)	• Ecosystems (condition and trends)
	Changes in vegetation, plant species, and soil from samples made in 1971 and 2001 at 103 sites chosen to be representative to woodland >4ha in Britain	Long Term Ecological Change in British Woodland (web publication)	• Ecosystems (conditions and trends)

A.3.10: Pressures on UK habitats

Pressure	Key messages from UK habitat surveillance and monitoring	Key monitoring and assessment schemes	Utility of the processes within an MA type assessment for England
Over-exploitation	Over-exploitation is not a major issue for most UK habitats, with the exception of grazing pressure. In the uplands overgrazing continues to cause both declines in quality and loss of habitats (such as increased bracken domination on moorland) - although in some cases this signal can be difficult to separate from other pressures such as eutrophication – and considerable turnover. Lack of	Countryside Survey; Common Standards Monitoring	• Ecosystems (condition and trends) • Drivers of change • Response options

Pressure	Key messages from UK habitat surveillance and monitoring	Key monitoring and assessment schemes	Utility of the processes within an MA type assessment for England
	management including recent declines in grazing is a more pertinent issue for some habitats (e.g. grasslands, heathlands), particularly in the lowlands.		
Pollution	Eutrophication, particularly from nitrogen deposition, has replaced acidification is the major current pollution impact, and is increasingly implicated as a major cause of habitat change as evidenced through floristic and soil changes. In the uplands there is a strong interplay between the eutrophication signal and over-grazing, whilst agricultural improvement drives eutrophication in grasslands. Habitats with less natural buffering capacity, such as dwarf shrub heaths, show the strongest eutrophication signal. Countryside Survey provides some evidence on eutrophication, which is supported by initiative such as BSBI atlases, the BSBI Local Change network and the Common Plants Survey. JNCC, Defra and other partners are investigating the feasibility of a new network for measuring the impacts of air pollution.	Countryside Survey, BSBI atlases, BSBI local change, Common Plants Survey (Plantlife)	• Ecosystems (condition and trends) • Drivers of change
Habitat loss	UK level surveillance suggests that the rate of direct habitat loss in the UK slowed during the 1990s as grazing issues and eutrophication became more important. However reporting information from the BAP process suggests that the loss of semi-natural habitats, particularly priority habitats, is still occurring. In the unenclosed uplands, grazing and eutrophication pressures continue to cause significant habitat change and loss, a finding supported by CSM results.	Countryside Survey, Land Cover Map.	• Ecosystems (condition and trends) • Drivers of change

Appendix 4:

Steps for conducting a ecosystem assessment for England

1. Establish a cross sectoral Steering Committee, including government representatives, private sector, public, research institutions and possibility EEA
2. Establish terms of reference for the Steering Committee, assessment coordinator and the assessment team
3. Establish terms of reference for the assessment, including
    a. Budget
    b. Questions to be answered by assessment
    c. Geographical coverage (including reporting units)
    d. Scales to be assessed (erg a catchment nested with in a county, and a county nested within country)
    e. Timeframe (e.g. how far into the past and the future the assessment should look)
    f. What components of human well being are paramount for assessment
4. Identify a coordinator for the assessment
5. Identify Coordinating Lead Authors (CLAs) for different sections
6. CLAs to identify team members to contribute to the assessment process
7. Identify key stakeholders and stakeholder organisations, including those which would contribute data and information and those which would benefit from the assessment
8. Develop a dissemination plan for the assessment
9. Communicate widely the commencement of the assessment
10. Adapt the MA conceptual framework to fit the assessment for England including identification of drivers of change and ecosystem services to be assessed, and review with experts and stakeholders NOTE 1: will need to use the MA conceptual framework and ecosystem services categorisation to be considered as part of the Sub-global assessment follow-up of the MA.
    NOTE 2: The conceptual framework will need to be reviewed throughout the life of the assessment.
11. CLAs to identify datasets required and the assessment Coordinator to put in place data licences for using the data in the assessment. This will be an ongoing process throughout the assessment process
12. Identify policy relevant scenarios. Questions to be asked:
    a. Why is the scenario exercise initiated?
    b. Who are the stakeholders that are most interested in the scenarios component of the assessment and what kind of information are they interested in?

    c. What should be gained from building scenarios in terms of concrete actions?
    d. What policies/plans/projects do you wish to inform?
    e. What type of scenarios is required? (qualitative, quantitative)
    f. What are the limitations relevant to this exercise in terms of time, expertise and logistics?
13. Start condition and trends components, including
    a. Establishment/identification of baseline information for future assessment
    b. Indicators, including environmental and human well being metrics
    c. Quantify ecosystem services (e.g. stocks and flows)
    d. Measure ecosystem integrity (e.g. supply and excessive use)
    e. Use conceptual framework to determine indirect and direct drivers of change on changes in ecosystem services and human well-being
    f. Present rate of change and status of different components of ecosystem services and human well-being
    g. Assess trade-offs
14. Peer review outputs from condition and trends assessment with experts
15. Update outputs in response to review feedback
16. Peer review outputs with experts and stakeholders
17. Update outputs in response to review feedback
18. Communicate findings from condition and trends assessment
19. Develop scenarios and storylines
20. Analyse scenarios
21. Develop text associated with scenarios
22. Peer review outputs from scenarios with experts
23. Update outputs in response to review feedback
24. Peer review outputs from scenarios with experts and stakeholders
25. Update outputs in response to review feedback
26. Communicate findings from scenarios
27. Based on the condition and status assessment and scenario outputs develop series of responses
28. Assess the potential impact of responses (e.g. legislative/governance, market based, education etc) including:
    a. The cost to government and stakeholders,
    b. Who needs to be involved in implementations,
    c. An ongoing monitoring programmes with indicators of success)
29. Peer review responses with experts
30. Update outputs in response to review feedback
31. Peer review responses with experts and stakeholders

32. Develop communication outputs as identified in the dissemination plan

33. Communication outputs of the ecosystem assessment as a whole

[Please note that information contained above is not for general distribution beyond Project code NR0118, as it will be released following publication of the ecosystem assessment manual towards the end of 2008]

Appendix 5: Examples of Best Practice – based on SGA review and analysis

All Sub-global assessments (SGAs) carried out as part of the Millennium Ecosystem Assessment (MA) followed a similar structure to the global assessment and in particular the structure that will be set out by the Ecosystem Assessment Manual. However, in many case Scenarios where not developed due to a lack of in country capacity. It should be noted that each SGA achieved different things. Below is a list of achievements and lessons learned from the SGA process. This information was obtained from questionnaires from SGA coordinators. The information will also be available through A CBD COP information document for COP9, 2008.

Impacts on policy making

It is still early to determine actual impacts on policy that SGAs have had, but there are some promising developments. These include:

1. A commission for the Caribbean Sea was established by the Association of Caribbean States following the release of the findings from the Caribbean Sea Assessment
2. National and local government activities have been influenced by the findings of SAfMA e.g. State of the Environment Reporting in South Africa incorporates findings of SAfMA. UNEP and DEFRA are funding a workshop in March 2008 which will focus on integrating MA findings into sustainable development policy.
3. Several policy makers in Vietnam have been using the findings of the Downstream Mekong River Wetlands Assessment.
4. In Sweden, the Kristianstad Wetlands was finally accepted as a biosphere reserve in 2005 and is now called Kristianstads Vattenrike Biosphere Reserve (KVBR), based on the findings from the SGA assessment.

Impacts on the private sector

The SGAs had very little impact on the private sector, but an example is:

1. In China, the Trade and Tourism Department in the provinces of the Mekong Delta used the findings of the ecosystem assessment for eco-tourism development especially in tourism to orchards and river tourism.

Impacts on science and education

In addition to the scientific publications generated by the SGAs, the findings of the SGAs have been used extensively in education. Including:

1. Workshops for teachers have been held on the Caribbean Sea, and the CARSEA case study materials made available as supporting material for the teaching of aspects of the secondary school science curricula
2. Course materials for a training of trainers course: 'Strengthen Environmental policy ad Management Capacity at the National and Local levels as a contribution to Poverty Alleviation and Sustainable Development in Africa' were developed by members of SAfMA for UNEP in 2005. The course materials were used in a training of trainers course run by members of SAfMA in South

Africa and attended by trainees from seven African countries. The aim of the course was to build capacity to undertake and use integrated ecosystem assessments in Kenya, Mali, Mauritania, Mozambique, Rwanda, Tanzania and Uganda. The training materials were translated into French and Portuguese. The training materials were subsequently used by UNEP to run a training course in Rwanda.

Lessons learned

Previous SGA teams have faced many challenges (in undertaking the assessment and dissemination of results), and it would benefit the ecosystem assessment for England to be aware for these challenges in the anticipation many can be overcome before an assessment begins. Challenges included:

- Funding in undertaking the assessment and dissemination of results
- Lack of data and information
- The right type of capacity to undertake the assessment (e.g. expertise and man power)
- Institutional and governance arrangements
- Timing of outreach

The generic lessons learned from the SGA process include:

- It is not easy to undertake assessment work – successful completion and implementation of assessments require a good understanding of the need for the assessment, and the methodology required both for undertaking assessment work, and then using the findings. Without a good appreciation of these, many SGAs have not been able to advance beyond a concept or very early stages of their work.

- Following on from the point above, it is clear that there is no one recipe for undertaking an assessment. The purpose and scope of an assessment will vary depending on several factors (including need, funding, available resources, and capacity). Knowing how to adapt prescribed methodologies rests very heavily on the experience of assessment practitioners and the ability to mobilise the right type of expertise and support. Few assessments were able to successfully do this.

- The importance of a champion/ strong leadership: many of the SGAs who have completed their work and have moved on to undertake successful outreach and follow-up initiatives have had the benefit of strong leadership, often in one person, or in a small group of individuals working as a team.