

# OPPORTUNITIES FOR UK BUSINESS THAT VALUE AND/OR PROTECT NATURE'S SERVICES

## FINAL REPORT

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# EXECUTIVE SUMMARY

## A. THIS PAPER

1. This paper is the Final Report of the study entitled '*Review of UK National Ecosystem Assessment (NEA) evidence to assess scope for business-related ecosystem market opportunities in the UK and tools for business sector uptake.*' (see Terms of Reference, **Annex 5**)
2. This study was commissioned for the Ecosystem Markets Task Force (EMTF) by the Valuing Nature Network (VNN), financed by the UK Department of Environment, Food and Rural Affairs (Defra) and the UK Natural Environment Research Council (NERC) and contracted through the University of East Anglia (UEA). VNN is an accredited activity of Living with Environmental Change (LWEC).
3. This paper provides:
  - ✓ an introduction to the business case for protecting and valuing nature's services, to the EMTF, and to the objectives and approach of this scoping study (**Part 1**);
  - ✓ a summary of the findings of the analysis of evidence in the NEA for business opportunities that protect and/or value nature (**Part 2**);
  - ✓ an overview of the various types of opportunities for UK business (**Part 3**);
  - ✓ suggestions as to most promising opportunities and what further research EMTF might support to take these forward (**Part 4**).
4. The annexes provide:
  - ✓ a (non-exhaustive) catalogue of 40 short proposals for potential business opportunities, 20 generated by the study team, 20 by external stakeholders (**Annex 1**);
  - ✓ details of the study workshop held on 30 April 2012 - programme, list of participants, proceedings (**Annex 2**);
  - ✓ an analysis of references in the NEA of relevance to business and market opportunities (**Annex 3**);
  - ✓ the conceptual framework for the study (**Annex 4**);
  - ✓ term of reference (**Annex 5**);
  - ✓ brief profiles of the study team (**Annex 6**).
5. **Attachment 1** provides a more detailed elaboration of 15 of the proposals for potential business opportunities generated by the study team.

## **B. THE BUSINESS CASE, THE EMTF, AND THE SCOPING STUDY (*Part 1*)**

### **The business case**

6. A series of drivers are leading businesses to increasingly consider and manage impacts on ecosystems and to look for business opportunities while they do this. Whereas it was until quite recently the case that most business action in this arena was driven by regulatory and other official requirements, there are now different drivers in play.
7. These new drivers include business risks arising from price volatility in key commodities, in part linked to resource scarcity and degradation. There are also changed stakeholder expectations that are driving different behaviour. Business-to-business pressures are also making an impact, as the demand for more sustainable production is fed between companies through supply chains and procurement.
8. Many companies are also reaping new business opportunities. These include enhanced reputations, entry into new markets and more comprehensive knowledge about the strategic and other risks they are exposed to.

### **The EMTF**

9. The 2011 Natural Environment White Paper contained a commitment to establish a business-led Ecosystem Markets Task Force to review the opportunities for UK business from expanding green goods, services, products, investment vehicles and markets which value and protect nature's services.
10. The EMTF will report in March 2013 to senior ministers (the Secretaries of State for Business, Innovation and Skills, for Energy and Climate Change, and for Environment, Food and Rural Affairs) through the Green Economy Council.
11. A range of work has been initiated by the EMTF since launch, including this scoping study, an EMTF call for evidence and in-house evidence scan and literature review. Taken together, these initiatives help provide the EMTF with a clear line of sight, with a view to delivery of its remit by March 2013. It is anticipated that the EMTF will commission further work to help deliver this remit.

### **The scoping study**

12. This study aims to: (1) Review the evidence available in the UK National Ecosystem Assessment; (2) Establish the potential for business opportunities based on nature's services; (3) Identify actions to enable relevant markets; (4) Identify priorities for further EMTF work.
13. The study involved development of a conceptual framework (**Annex 4**), application of this framework for analysis of the NEA (**Part 2, Annex 3**), innovative thinking within the study team to identify, elaborate and assess business opportunities, related enabling actions and areas for further work (**Part 3, Part 4, Annex 1A, Attachment 1**), and stakeholder consultation. The latter was based on a Discussion Paper, and involved a workshop (**Annex 2**) and peer review process (mailing to c.500 recipients). Stakeholders were invited to review the team's analysis and suggest additional business opportunities (**Annex 1B**).

14. The workshop, held at Imperial College London on 30 April 2012, attracted 65 participants, predominantly from business, but also from government, non-governmental organisations and academia; 3 EMTF members attended. The workshop considered and added to the long-list of opportunities identified by the study team, and developed a number of additional specific opportunities. It was a success in terms of engaging business and other interests in the work of the EMTF, bringing a wide range of knowledge to bear on the study, and generating additional business ideas. Any follow-on work should aim to build on this lively stakeholder interest.

### **C. EVIDENCE IN THE UK NATIONAL ECOSYSTEM ASSESSMENT FOR BUSINESS OPPORTUNITIES THAT VALUE AND/OR PROTECT NATURE'S SERVICES (*Part 2, Annex 3*)**

15. The NEA provides a wealth of detail on the state of the UK's ecosystems, the services they provide, and the value of these services. Our conceptual framework (***Annex 4***) provides a logical series of steps by which we analysed this wealth of detail, in order to extract relevant references to business opportunities. These references occur throughout the NEA, in the chapters on drivers of ecosystem change, on state and trends in habitats, on state and trends in ecosystem services, on changing ecosystem service values, and on response options (***Annex 3***).
16. We compiled on the basis of this analysis an initial long-list of potential business opportunities (***Table 9, page 19 ff***). These opportunities are either explicitly referred to in the NEA, or could be inferred from the NEA. This initial long-list served as a basis for discussion with stakeholders at our workshop of 30 April 2012.

### **D. OVERVIEW OF BUSINESS OPPORTUNITIES (*Part 3*)**

17. Building on our analysis of the NEA, and our team's knowledge of ecosystem-related markets, we have identified 8 main 'types' of business opportunity (the borders between these types are not necessarily clearly defined, for example between offsetting and payment for ecosystem services). The eight types are:

#### ***(1) Product markets***

Products derived from and/or sustaining ecosystem services are a familiar means whereby companies seek both business opportunity and the means to protect and/or value nature's services. Certification schemes of different kinds have been an important enabler in the growth of more sustainable products.

#### ***(2) Offsetting***

Biodiversity offsets, which can be implemented through conservation banking, are an ever more prominent feature in how companies are seeking to manage their impacts on ecosystems. They work by compensating residual impacts on ecosystems in one place by creating equivalent ecosystem benefits elsewhere.

#### ***(3) Payment for ecosystem services (PES)***

Payments for Ecosystem Services (PES) embrace a variety of schemes through which the beneficiaries, or users, of ecosystem services provide payment to the stewards, or

providers, of ecosystem services. PES aims to identify the stakeholders that benefit from a specific ecosystem service and creates a mechanism through which a payment can be made to the provider of the service.

#### ***(4) Environmental technologies***

Environmental technologies prevent or treat pollution, enhance management of ecosystems, and enable more efficient resource use. Such technologies are relevant in all industrial sectors. The range of possible technological solutions is broad, encompassing direct interventions to ecosystems such as river restoration or wetland construction, as well as more systemic changes which can yield diverse and substantial yet sometimes not immediately perceivable ecosystem benefits, including less resource-intensive production processes.

#### ***(5) Markets for cultural services***

Markets for cultural services are derived from the environmental settings that give rise to cultural goods and benefits, including tourism, recreation and health benefits. Prominent among such environmental settings are gardens, informal and formal green and blue spaces, the countryside and national landscapes and seascapes. Also related are opportunities in the housing and construction sectors.

#### ***(6) Financial and legal services***

Financial and legal services are enabling activities relevant to ecosystem service business opportunities in the same ways they are relevant to the wider economy; for example financial services enable capital to be invested in product markets, legal services secure property rights which underpin payment for ecosystem services or offsetting.

#### ***(7) Ecosystem knowledge economy***

Ecosystems provide opportunities to develop knowledge-based businesses providing high quality employment and growth opportunities. The UK could emerge as an international leader in the knowledge base needed to protect of ecosystems and achieve the sustainable use of ecosystems and their services.

#### ***(8) Corporate ecosystem initiatives***

Many companies are already voluntarily taking actions that may not be covered in the categories set out above. Driven by a number of factors, including the need to enhance or protect brands, to meet consumer demand, manage supply chain issues or simply because of the desire among management to 'do the right thing'. Some companies have seen strategic and systemic risk arising from ecosystem degradation and are taking actions to understand what these risks are and what might be done to mitigate them.

18. **Table 9** presents a non-exhaustive long-list, derived from the NEA, of business opportunities that value and/or protect nature. This long-list could be extended considerably with reference to the various ideas subsequently developed by the study team and suggested by stakeholders.

## **E. SPECIFIC POTENTIAL BUSINESS OPPORTUNITIES (*Annex 1, Attachment 1*)**

19. Building on the above long-list, we have collated a catalogue of 40 outline proposals for potential specific business opportunities (***Annex 1***), 20 generated by the study team (***Annex 1A***), 20 by external stakeholders (***Annex 1B***). The latter are rather less developed given the workshop time constraints. **Table 10** (pages 50-51) lists all 40 proposals.
20. Our catalogue of proposals is by no means exhaustive, but is designed to be illustrative in demonstrating the range of opportunities that could exist, should the correct enabling frameworks be put in place.
21. The catalogue is organised according to the above typology (para 17). For example, under 'product markets', we suggest opportunities in relation to: better certification; moves to enable the recovery of fisheries; an expanded market for sustainably produced wood-fuel; redesign of packaging so that it becomes an energy source.
22. Any one opportunity may relate to more than one 'type'; we have therefore allocated each to the 'type' for which it has greatest affinity, but also identified to which other types each opportunity has some affinity.
23. For each proposal, we provide: (1) a brief description of the opportunity, (2) mention of which business sectors or types might be implicated, (3) a rough estimate of the potential size of the market, (4) an indication of the potential benefit to ecosystems, (5) a brief assessment of what actions might be needed to make the opportunity work in practice, and (6) suggestions for further EMTF research on the opportunity.
24. In ***Attachment 1***, we present a more detailed analysis of 15 of the proposals generated by the study team. This includes consideration of a range of characteristics of delivery of ecosystem services of relevance to the creation of markets that protect and value nature – such as scale, the kind of market failure involved, property rights, and the distribution of providers and beneficiaries of nature's services. (It was not possible in the time available to carry out this level of analysis for all of the team proposals, or for the 20 proposals submitted by stakeholders.)
25. Various proposals may be linked, overlapping, or mutually supportive. The list of opportunities would therefore benefit from further review, consolidation, and packaging/ bundling of related opportunities.

## **F. PROMISING POTENTIAL BUSINESS OPPORTUNITIES, RELATED ENABLING ACTIONS, AND SUGGESTED FURTHER RESEARCH BY EMTF TO TAKE THESE FORWARD (*Part 4*)**

26. **Part 4** of our report highlights 12 opportunities which we believe show particular promise both in terms of short- to medium-term market potential, and in terms of potential benefit to UK ecosystems. We have ranked and present these ideas in order of their potential, as judged by the team. However, we would stress that this is a very tentative ranking and that further reflection would be required to validate such ranking.
27. The exclusion of other opportunities in ***Annex 1*** from those highlighted here does not necessarily mean they hold less promise. We urge EMTF to give due consideration to each of the opportunities presented in ***Annex 1***.

28. The 12 opportunities highlighted here offer a balance between those which might be taken forward largely by business alone, and those which might also require enabling action by government, in terms of policy and/or regulatory measures.
29. For each of the 12 opportunities presented in **Part 4**, we indicate why we like it, and outline what further work EMTF might undertake to take it forward, with a view to preparing robust recommendations to Government. More detail on possible further research is given in the related proposals in **Annex 1** and **Attachment 1**. **Annex 1** and **Attachment 1** also contain suggestions for further research in relation to most of the other proposals for potential business opportunities not highlighted in **Part 4**.
30. Our suggestions for further EMTF research work presented below, in **Part 4**, **Annex 1** and **Attachment 1**, might also inform research and knowledge exchange work under a possible second phase of the Valuing Nature Network (currently under preparation), under the recently launched UK National Ecosystem Assessment follow-on phase, and under other research and knowledge exchange programmes such as those funded by NERC, other research councils, and the Technology Strategy Board.
31. Many of the business opportunities identified in **Annex 1** are linked and the pursuit of various sets of linked proposals might deliver synergies in terms of both market potential and ecosystem benefit. Further analysis of such potential synergies might be a profitable element of any further EMTF work.
32. In taking forward various business opportunities, a key challenge facing EMTF is engagement of the wider business community. We suggest that EMTF should build on the business sector consultation initiated by this study in the next phase of its work. EMTF should also consider ways in which it might strengthen engagement with other stakeholders, particularly the conservation and environment NGOs, in order that final EMTF recommendations are all the more robust.
33. While our brief has focussed on identifying specific business opportunities, the wide range of opportunities that are emerging raises various macro-economic implications, and we outline some of these in **Part 4**. For example, regulations can establish compliance markets and influence the way ecosystems are classified as assets. While micro-level actions can trigger and/or speed-up development of new and/or existing markets, long-term prospects for ecosystem markets are heavily dependent on macro-scale policy decisions.
34. It could be argued that even such macro-economic changes would only go some way towards changing the market signals required to maintain and enhance ecosystems and their services, and that there is a need for a more fundamental systems change in the way that our economy and society accounts for, manages and uses natural capital. Current government initiatives such as the Natural Capital Committee, natural capital asset check and efforts to fully incorporate natural capital in the UK Environmental Accounts are important steps towards better accounting for the value of ecosystems in decision making processes.
35. While many of the market opportunities identified in this report arise from incremental changes that encourage markets to take better account of the value of nature, more fundamental changes in the way that we take account of the value of ecosystems in planning, economic development and wider decision making could have more profound impacts on the working of markets and the role of business.

36. Given the above considerations and provisos, the 12 potential business opportunities which we highlight are ranked as follows:

- **Rank 1=: BIODIVERSITY OFFSETS, INCLUDING THROUGH CONSERVATION BANKING (Opportunity T2.1 - Offsetting)** – The opportunity is to stimulate the creation of a range of new companies and new business models for existing companies (or non-profit organisations) to provide biodiversity offsets in the UK, by moving from the current voluntary approach to a (soft regulation) mandatory regime. Could deliver benefits to a wide range of ecosystems, particularly through pooling offset credits to restore and create larger-scale habitats delivering net ecological gain.
- **Rank 1=: PEATLAND CARBON CODE (Opportunity T3.2 – Offsetting, PES)** – Development of a peatland carbon code to provide a transparent, verifiable framework for companies to purchase carbon credits to support restoration and re-wetting of degraded peatlands. Consequent carbon savings could then be sold on the voluntary carbon market. Should government recognise peatland in its greenhouse gas accounting procedures, they could also be presented in company reports as part of their CR initiatives. Significant potential for upland peatlands, notably Scotland.
- **Rank 3: WOODLAND ENHANCEMENT THROUGH A LARGER MARKET FOR WOOD FUEL (Opportunity T1.4 – Product Markets)** – A business opportunity to meet growing demand for woodfuel and wood-burning stoves from UK woodlands, offering significant potential to enhance woodland ecosystems.
- **Rank 4: DEVELOPING THE UK ECOSYSTEMS KNOWLEDGE ECONOMY (Opportunity T7.1 – Ecosystems Knowledge Economy)** – Ecosystems provide opportunities to develop knowledge-based businesses providing high quality employment and growth opportunities. The UK plays a leading role internationally in ecosystem related knowledge - there is an opportunity to build on this knowledge-base and to strengthen collaboration between business and knowledge based institutions in order to maximise business opportunities.
- **Rank 5: LAYERED PES (Opportunity T3.3 - PES)** – In layered PES schemes different ecosystem services, which arise from the same area of land, are sold to different buyers. Government financed PES are currently ‘bundled’ and there is an opportunity to ‘un-bundle’ and re-structure these schemes to align them with PES best practice, where payments are differentiated, spatially targeted, and conditional. Could deliver benefits to a wide range of ecosystems.
- **Rank 6: CARBON SEQUESTRATION AS AN ‘ALLOWABLE SOLUTION’ (Opportunity T3.1 – PES)** – Government announced in 2007 that all new homes will be zero carbon from 2016. Offsite ‘Allowable Solutions’ will be needed to meet this requirement. This could in part be achieved by permitting developers to buy ‘Allowable Solutions Certificates’ generated by carbon sequestration through woodland creation or peatland restoration.
- **Rank 7: EXPANDING THE REACH AND VALUE OF SUSTAINABILITY CERTIFICATION (Opportunity T1.1 – Product Markets)** – The opportunity is to sustain and grow the market for sustainably produced products and to expand the cover of sustainability

assurance to sectors or segments currently not covered. This will create business opportunities for producers, intermediaries, retailers and related services. Of particular relevance for agricultural ecosystems.

- **Rank 8: OPTIMIZING THE ECOLOGICAL AND ECONOMIC BENEFITS OF SUSTAINABLE TOURISM (T5.1 – Markets for Cultural Services)** – Opportunities include: make green and blue spaces more accessible; enhance quality and experience of recreation; better distribute visits from domestic and international tourism; invest tourism income in host ecosystems; provide amenity housing; restore ecological sites of tourism interest; to promote existing attractions; create new sustainable tourism infrastructure; better promote UK natural and cultural endowments internationally; assess and address travel footprints in UK; developing nature-based health tourism.
- **Rank 9=: GLOBAL CENTRE OF EXCELLENCE FOR ECOSYSTEM SERVICES CERTIFICATION (Opportunity T1.2 – Product Markets)** – Creation of a global centre of excellence that sells professional services that foster best practices in certification of products that benefit ecosystem services. Could deliver benefits to ecosystems in the UK and worldwide.
- **Rank 9=: WATER RE-USE TECHNOLOGIES (Opportunity T4.1 – Environmental Technologies)** – The development and application of technologies to increase re-use of water at the level of individual (or local groups of) businesses. Could deliver considerable business cost savings and income generation, enhanced water self-sufficiency for businesses. This would alleviate water scarcity, reduce pollution, water extraction and energy consumption, with considerable benefit to freshwater and coastal ecosystems.
- **Rank 11: REDUCING RISK FOR INSURERS THROUGH INVESTMENT IN GREEN INFRASTRUCTURE (Opportunity T6.1 – Financial & Legal Markets)** – Recent years have seen large-scale losses to the insurance industry as a result of extreme weather, such as flooding. Extreme events are becoming more common, and could eventually create a systemic challenge to an industry that is based in large part on the assessment of risk based on past events. As new circumstances emerge in relation to the more frequent occurrence of extreme events, it might be that insurers could reduce their exposure through the enhancement of green infrastructure, such as woodlands, floodplains, coastal wetlands and upland peat bogs.
- **Rank 12: DEVELOPING ENVIRONMENTAL BONDS AS VEHICLES FOR INVESTMENTS IN NATURE (Opportunity T6.2 – Financial & Legal Markets)** – A number of asset classes such as biodiversity, water, carbon, which are co-located on the same area of land, could be ‘stacked’ and an environmental bond created, providing a stable investment return, underpinned by for example government. Financing by government could leverage scaled-up investment which would help fund green growth and jobs.

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# 1 INTRODUCTION

## 1.1 *THE BUSINESS CASE FOR VALUING & PROTECTING NATURE'S SERVICES*

1. A wide range of factors are moving companies to adopt more sustainable practices, including in relation to the management and sustainable use of ecosystems.
2. For decades the progressive development of business practices more aligned with ecological goals has been in large part driven by legislation and regulatory frameworks. While official regulations remain a central part of environmental delivery, there is also growing interest in the use of market-based approaches. These range from certification schemes to biodiversity offsets, and the development of new products and services derived from sustainable ecosystem management.
3. But why would companies wish to explore their possible participation in different kinds of ecosystems markets?

### **Risk management**

4. Growing demand for and impact on environmental services is creating market stresses, for example as demand exceeds supply in relation to key resources such as freshwater. This pressure will be exacerbated by environmental changes and could become embedded as a structural factor causing progressive long-term rises in commodity prices and placing extra costs on planning and licensing processes. This will hamper the ability of some businesses to follow their strategies.
5. Another source of risk is linked to the reputational harm that can accompany brands being linked with different aspects of ecosystem damage.
6. Even among those business organisations that are prepared to accept these risks there are other drivers that will continue to encourage stronger performance in using ecosystems and the services they provide in more sustainable ways.

### **Legislation and policy**

7. Public demand for high environmental standards has remained strong, even during the recent period of economic hardship. As development pressures, such as more housing and infrastructure in already densely populated islands, become greater, the public and shareholders seek reassurance that social and environmental issues are adequately taken into consideration in planning, licensing, product development and marketing. As a result, policy makers are unlikely to weaken the various regulatory frameworks that set the long-term direction of travel in relation to how companies manage their impacts on ecosystems.
8. On the contrary, regulatory frameworks might be strengthened. For example, as real-world trends in relation to ecosystem quality become more acute, there will be pressures to tighten regulatory codes, including at EU level. There are also drivers coming from global

processes, including targets adopted by the Convention on Biological Diversity, and these are reflected in decisions and frameworks adopted by national governments.

9. Government in the UK has said that it wishes to explore the opportunities for businesses in pursuing ecosystem-based markets. This in turn might well entail new official frameworks and incentives. Early innovators in ecosystem markets will be in a stronger competitive position as regulatory measures change.

#### **Stakeholder expectations**

10. At the same time that regulatory frameworks will continue to demand strong performance for sustainability, the elevated expectations of stakeholders will exert direct market pressure on companies. Consumers now expect high standards in relation to environmental and social goals.
11. Companies are expected to know what their impacts are and to be managing them. Consumers increasingly differentiate brands in relation to their commitment to meeting environmental goals. This will remain an important aspect of companies' profiles with their customers. Non-governmental groups remain vigilant and effective in their ability to expose brands working with lower standards.

#### **Business to business demands**

12. Companies in a wide range of business sectors are taking on stretching and ambitious sustainability and environmental programmes. These often include attention to supply chains and the services that companies buy. The specification of high environmental standards in procurement choices is creating new business dynamics that will present further points of differentiation as some emerge as suppliers of choice and in so doing expand their market share.
13. Even if companies wish to ignore the deepening discussion about sustainability and ecosystems, they may find that the companies they do business with have moved on and are working to different goals and with different suppliers and partners.

#### **Opportunity as well as risk**

14. As well as anticipating risks and pressures there are also many opportunities, including new client and customer offers. Companies embracing ecosystem opportunities will be able to innovate and in so doing achieve competitive advantage.
15. Companies in a variety of sectors are realising that investment in more sustainable practices, including market-based aspects of ecosystem management, can deliver brand differentiation and attract the new talent they need to thrive and grow.
16. Many companies also realise that by responding to ecosystem-related challenges they are in a better position to manage their businesses more generally, for example through having a more comprehensive understanding of their supply chains. This dimension is also increasingly recognised by investors as a mark of a well-run company that is aware of the spectrum of risks it is exposed to.

## Summary

17. Several drivers combine to create a business case for companies to participate in emerging ecosystem-based market opportunities. The strength of the drivers varies between sectors and companies but for many there are good reasons to explore the opportunities at hand.

## 1.2 THE ECOSYSTEM MARKETS TASK FORCE

### Membership

#### Chair

**Ian Cheshire**, Group Chief Executive Officer, Kingfisher plc

#### Members

**Kim Buckland**, Co-Founder, Liz Earle

**Vivienne Cox**, Chair, Climate Change Capital

**Jack Frost**, Director, Johnson Matthey Fuel Cells

**David Hill**, Chairman, Environment Bank

**Russ Houlden**, Chief Finance Officer, United Utilities

**Mike Wright**, Executive Director, Jaguar Land Rover

**Martin Roberts**, Programme Director, Cambridge Natural Capital Leaders Platform

**Amanda Sourry**, Chairman, Unilever UK and Ireland

**Peter Young**, Strategy Director, SKM Enviros and Chairman, Aldersgate Group

### What will the Task Force do?

18. The 2011 Natural Environment White Paper<sup>1</sup> contained a commitment to establish a business-led Ecosystem Markets Task Force (EMTF) to review the opportunities for UK business from expanding green goods, services, products, investment vehicles and markets which value and protect nature's services.
19. The EMTF<sup>2</sup> will report in March 2013 through the Green Economy Council to the Secretaries of State for Environment, Food and Rural Affairs, for Business, Innovation and Skills, and for Energy and Climate Change. The intention is that the advice provided is just as relevant for a business audience and should be developed with this audience in mind.
20. The Task Force will provide an overall assessment of the market opportunities, provide a clearer view of the economic and environmental benefits that could be achieved, and identify the most promising opportunities.

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<sup>1</sup> <http://www.defra.gov.uk/environment/natural/whitepaper>

<sup>2</sup> [www.defra.gov.uk/ecosystem-markets](http://www.defra.gov.uk/ecosystem-markets)

21. It will advise on the scope for market development and value creation for businesses linked to ecosystem services. It will also advise on the range of issues and potential actions that might enable UK business to more fully take up these opportunities in the future.
22. It will identify and prioritise actions to enable and secure these market opportunities, taking account of the benefits that could potentially be realised (to business and the environment) as well as the costs and level of challenge involved.

### **1.3 THE SCOPING STUDY**

#### **1.3.1 Purpose and objectives**

23. This brief study,<sup>3</sup> entitled '*Review of UK National Ecosystem Assessment Evidence to assess scope for business-related ecosystem market opportunities in the UK and tools for business sector uptake*', was commissioned for the Ecosystem Markets Task Force (EMTF) by the Valuing Nature Network (VNN),<sup>4</sup> financed by the UK Department of Environment, Food and Rural Affairs (Defra) and the UK Natural Environment Research Council (NERC) and contracted through the University of East Anglia (UEA). VNN is an accredited activity of Living with Environmental Change (LWEC).<sup>5</sup>
24. The study (Terms of Reference, **Annex 5**) aims to inform the work of the EMTF by providing a review of evidence, from the UK National Ecosystem Assessment (NEA),<sup>6</sup> for business sector opportunities from expanding markets that value and protect nature's services, and by assessing the appropriate tools for enabling these opportunities to be realised.
25. Study objectives are:
  - (1) To develop a conceptual framework for the review;
  - (2) To identify, through analysis of the NEA (using this framework) (a) short- and medium-term business opportunities (including new markets and greening of existing markets) and (b) ecosystem stocks and/or flows where business opportunities are more limited;
  - (3) To assess actions to enable markets to contribute to sustainable delivery of major ES-based goods currently not or under-provided, notably (a) goods or business sectors where quick progress can be made, (b) issues/constraints of a macro-economic or systemic nature, (c) where there is a business rationale for market provision independent of government action but where barriers might exist; and
  - (4) To make recommendations to EMTF for further work and analysis based on the above understanding of some of the key areas for existing, new and emerging

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<sup>3</sup> The study ran over a 2-month period, mid-March to mid-May 2012

<sup>4</sup> <http://www.valuing-nature.net/>

<sup>5</sup> <http://www.lwec.org.uk/>

<sup>6</sup> UK National Ecosystem Assessment (2011) *The UK National Ecosystem Assessment: Technical Report*. UNEP-WCMC, Cambridge. <http://uknea.unep-wcmc.org/Resources/tabid/82/Default.aspx>

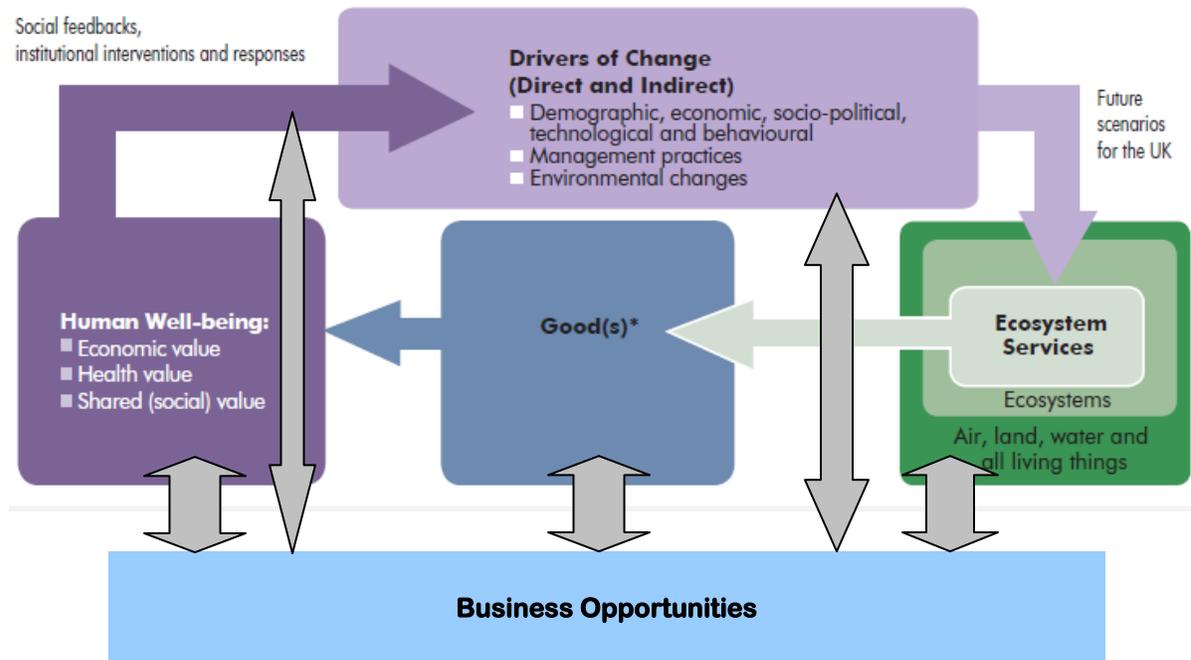
opportunities, and recommendations on how EMTF might best inform the next phase of the NEA.

### 1.3.2 Approach and methods

#### Review of NEA and initial identification of business opportunities

26. The NEA provides a wealth of evidence on the state and trends of UK ecosystems and ecosystem services (ES) they supply, the importance of ecosystems to our economy and society, and the value of existing ES, only part of which is currently captured by markets. We developed a conceptual framework (**Annex 4**) to review this evidence with a view to identifying business opportunities.
27. *Figure 1* shows graphically how business opportunities may arise in relation to each stage of the cycle of the NEA conceptual framework.

**Figure 1: Business opportunities in relation to the NEA conceptual framework**



28. Our own conceptual framework has allowed us to map ecosystems, ES and the values deriving from ES to business opportunities and sectors. A summary of the results of this analysis is presented in **PART 2 and Annex 3** of this paper.
29. Building on the analysis of the NEA, we applied our knowledge and experience to think innovatively about the potential for business sector opportunities based on ecosystems, both in terms of new markets and in terms of greening of existing markets. Consideration was given to barriers to business uptake (e.g. policy stability, uncertainty, inappropriate

business models) and to various important characteristics of delivery of ES (e.g. spatial scale, trade-offs, potential to bundle, stack and layer ES).

### **Stakeholder engagement – workshop and peer review**

30. Building on the work of the team, we ran a workshop and rapid peer review process, with the following objectives:
  - (1) to bring stakeholders up to speed on EMTF and the study;
  - (2) to engage stakeholders in helping to: (a) validate the long-list of business opportunities generated by the study team, and fill gaps; (b) identify the more promising opportunities, explore their market and ecosystem potential, necessary enabling actions, and further work required;
  - (3) to encourage engagement in ongoing EMTF work including the recent EMTF call for evidence.
31. To inform the workshop and peer review, we issued our interim findings in a Discussion Paper, which: (1) provided an introduction to the EMTF, the scoping study and the workshop and peer review process; (2) summarised the evidence in the UK National Ecosystem Assessment for business opportunities linked to nature’s services); (3) provided an overview of the various types of opportunities for UK business, and related enabling activities required to realise these; and (4) provided specific examples of emerging ideas for business opportunities.
32. The paper was issued to a mailing list of c. 500 recipients, including:
  - ✓ representatives of, and participants in, relevant business sectors, including: agriculture, forestry, fishing, mining and quarrying, food manufacturing, pharmaceuticals, other manufacturing, energy, water and waste water, construction, transport, tourism and recreation, wholesale and retail, creative, media and marketing, financial services, consultancy, public administration, education;
  - ✓ those interested in new and emerging markets, or greening of existing markets, related to nature’s services;
  - ✓ those involved in, or interested to engage in, all types of business opportunity related to nature’s services, including: product markets; offsetting; payment for ecosystem services, environmental technologies, markets for cultural services; financial and legal services; ecosystem knowledge economy; corporate ecosystem initiatives.
33. Recipients were invited to comment on the Discussion Paper and to submit ideas for business opportunities on a standard form. The workshop, entitled ‘*Opportunities for UK business that protect and value nature*’, was held at Imperial College London on 30 April 2012 and attracted 65 participants (**Annex 2B**) including 3 members of the EMTF.
34. The workshop programme (**Annex 2A**) involved a series of plenary sessions and break-out sessions. In the morning break-out, 5 groups discussed the long-list of business

opportunities generated by the study team and suggested other ideas to add to the long-list. In the afternoon, participants were broken in to 6 groups, each of which addressed a specific 'type' of business opportunity. These afternoon break-outs fleshed out additional business opportunities in a little more detail, considering also enabling actions required for each opportunity, and possible areas for further EMTF research. The workshop discussions are summarised in **Annex 2C**, and specific business ideas generated by the workshop (or submitted before or after the workshop by external stakeholders) are provided in **Annex 1B**.



## 2 EVIDENCE IN THE UK NEA FOR BUSINESS OPPORTUNITIES THAT VALUE AND/OR PROTECT NATURE'S SERVICES

35. In this section, we present our findings in terms of evidence in the UK National Ecosystem Assessment (NEA) for business opportunities that value and/or protect nature's services.

### 2.1 THE NEA – IMPLICATIONS FOR ECOSYSTEM MARKET OPPORTUNITIES

36. The NEA provides a detailed and structured overview of the state of the UK's ecosystems and the services they provide to society and the economy. It looks at trends in different habitats at UK level and in the four countries (England, Northern Ireland, Scotland and Wales), the drivers and pressures affecting ecosystems, the services that ecosystems provide to society (provisioning, regulating, cultural and supporting services) and the value of these services. The assessment also identifies responses to the trends and pressures that are affecting the UK's ecosystems.

37. While the NEA does not specifically focus on the interactions between business and ecosystems, it provides much evidence of the role of different business sectors and activities in affecting ecosystems and their services, the extent to which businesses rely on ecosystems and the services they provide, and the opportunities that efforts to enhance ecosystems and their services could provide for the creation of new markets and business opportunities.

### 2.2 DRIVERS OF CHANGE IN UK ECOSYSTEMS, LINKS TO BUSINESS

38. The NEA identifies the following main drivers of change on UK ecosystems: habitat change; pollution and nutrient enrichment; overexploitation; climate change; invasive species. Business has a key influence on these drivers, either directly (for example through development decisions) or indirectly (for example through businesses' use of resources or their greenhouse gas emissions). Evidence in the NEA enables us to examine the pressures on ecosystems caused by different business sectors (**Table 1**).<sup>7</sup> The NEA shows that a wide range of business sectors contribute to land use change, pollution and climate change, while the greatest pressures are often caused by particular sectors such as agriculture, fisheries, energy, transport, water and construction.

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<sup>7</sup> Note that many of these sectors may also have beneficial impacts on ecosystems (e.g. through habitat restoration by mining and quarrying companies).

**Table 1: Links between Business Sectors and Pressures on Ecosystems**

Sector	Habitat change	Pollution and nutrient enrichment	Overexploitation	Climate change	Invasive species
Agriculture	XX	XX	X	XX	X
Forestry	XX	X	X	X	X
Fishing	XX	X	XX	X	
Mining and Quarrying	XX	X	X	X	
Manufacturing	X	XX	XX	X	
Energy	XX	XX		XX	
Water	XX	XX	XX	X	
Construction	XX	X		XX	
Distribution/ retail	X	X	X	XX	XX
Transport	XX	X		X	XX
Tourism	XX	X		XX	
Financial services	X	X	X	X	X

KEY: **XX** – strong link between sector and pressure; **X** – link between sector and pressure

**Table 2: Responses to Pressures on Ecosystems Identified in NEA**

Response or solution	Habitat change	Pollution and nutrient enrichment	Overexploitation	Climate change	Invasive species
Sustainable products	X	X	X	X	
Environmental technologies	X	X	X	X	X
Sustainable construction	X	X	X	X	
Conservation and sustainable exploitation of genetic resources	X		X		
Offsets	X			X	X
Payments for ecosystem services	X	X		X	

39. The NEA also identifies a number of responses and potential solutions to these various pressures, which may provide opportunities for businesses (**Table 2**). For example, the development and certification of sustainable food, timber and other products has the potential to address a wide range of impacts on ecosystems. Biodiversity offset schemes could help to address the residual loss of habitats to development (after avoidance and minimisation) and carbon offsets could reward the role of ecosystems in storing carbon.

### **2.3 STATE AND TRENDS OF UK ECOSYSTEMS AND ECOSYSTEM SERVICES, LINKS TO BUSINESS**

40. The NEA documents the profound changes that have occurred in different habitats in the UK in recent decades. The landscape of the UK has changed markedly during the last 60 years with the expansion of Enclosed Farmlands, Woodlands and Urban areas, and the contraction and fragmentation of Semi-natural Grasslands, upland and lowland Heaths, Freshwater wetlands and Coastal Margin habitats. Changes in the extent and condition of habitats have significantly altered the ecosystem services they provide. Crop and livestock production have increased significantly, but been accompanied by a loss of landscape diversity, an increase in soil erosion and reduced soil quality, and a reduction in farmland birds and pollinators. However, there have been a number of recent improvements, including a reduction in greenhouse gas emissions, due to both reduced fertiliser application and lower livestock numbers, and improved chemical quality of water.
41. The expansion of woodlands has contributed to both improved climate regulation, through greater carbon sequestration, and air quality, while at the same time increased timber supply. More recent changes in forest policy and woodland management have enhanced general amenity value and wild species diversity. Expansion of urban areas has degraded regulating services for climate, hazards, soil and water quality, and noise. Fragmentation and deterioration of wetlands, and in particular the separation of rivers from their floodplains, has compromised hazard (flood) regulation and many other ecosystem services. Across all habitats apparent reductions in soil quality and continuing declines in the diversity of many wild species, including the variety and abundance of pollinators, is of particular concern.
42. **Table 3** summarises the contribution of business sectors to these trends and pressures affecting habitats. It shows that most sectors have impacted either directly or indirectly on a range of different habitats, through land use change, pollution and or their demand for resources.<sup>8</sup>
43. There are major differences in the way that business activities impact on ecosystems. For example, in some sectors there are major problems connected to over-exploitation (e.g. of fish and soil resources), but in other sectors problems relate to under-management (e.g. of small woodlands). Added to this are different levels of resilience in different ecosystems (e.g. adaptability to climate change). Therefore, different business sectors can impact on

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<sup>8</sup> Note again that many of these sectors may also have beneficial impacts on ecosystem services (e.g. through habitat restoration by mining and quarrying companies).

ecosystems in very different ways. These differences influence the types of business opportunities that arise, which can range from landscape-wide approaches (e.g. certification), to targeted research on specific problems (e.g. pollination).

**Table 3: Contribution of sectors to pressures on different habitats**

Sector	Pressures	Mountains, moorlands and heaths	Semi-natural grasslands	Enclosed farmland	Woodland	Freshwaters	Urban	Coastal margins	Marine
Agriculture	Expansion, intensification, loss of landscape diversity, air pollution, water pollution, climate change, invasive alien species	X	X	X	X	X		X	X
Forestry	Habitat loss caused by afforestation	X	X	X	X				
Fishing	Overexploitation of fish stocks, damage to marine habitats							X	X
Mining and Quarrying	Habitat loss, fragmentation, habitat damage caused by extraction	X	X	X	X			X	X
Manufacturing	Air and water pollution, climate change, habitat loss through development, resource use	X	X	X	X	X	X	X	X
Energy	Air pollution, water pollution, climate change, habitat change through renewables development	X	X	X	X	X	X	X	X
Water	Water pollution, water abstraction, modification of habitats					X		X	X
Construction	Habitat loss due to development, resource use, climate change	X	X	X	X	X	X	X	X
Distribution/retail	Demand for food and materials, land use change, contribution to climate change	X	X	X	X	X	X	X	X
Transport	Air pollution, habitat loss due to infrastructure development, spread of invasive alien species	X	X	X	X	X	X	X	X
Tourism	Habitat loss due to development, erosion, disturbance	X			X	X	X	X	
Financial services	Financing activities in other sectors	X	X	X	X	X	X	X	X

44. Different business sectors also play an important role in delivering solutions to many of the pressures affecting these habitats (**Table 4**).

**Table 4: Role of sectors in addressing pressures on ecosystems**

Sector	Role in addressing pressures on ecosystems
<b>Agriculture</b>	Agri-environment schemes and voluntary initiatives are enhancing environmental performance of sector and reintroducing lost practices and features
<b>Forestry</b>	Increasing role of conservation and amenity uses of woodlands, reinstating traditional management methods (e.g. coppicing)
<b>Construction</b>	Building on brown field sites, sustainable construction materials and methods to minimise impacts on ecosystems and climate, provision of green infrastructure to enhance ecosystem services, biodiversity offsets
<b>Distribution/ retail</b>	Role of retailers in promoting certified produce and facilitating demand for produce with lower impacts on ecosystems
<b>Media</b>	Role in enhancing awareness of issues affecting ecosystems and driving positive change
<b>Energy</b>	Sustainable biomass schemes (e.g. linked to grasslands and native woodlands)
<b>Water</b>	Payments for ecosystem services, role in restoration of catchments
<b>Environmental technologies</b>	Ecosystems monitoring, habitat restoration, reductions in air and water pollution, changes in agriculture/forestry/ fisheries techniques, water saving technologies, control of invasive alien species, control of pests and diseases
<b>Tourism</b>	Sustainable tourism initiatives to reduce impacts, visitor payback schemes to enhance ecosystem conservation

45. The NEA links changes in ecosystem services to the five principal pressures affecting ecosystems (habitat change, pollution and nutrient enrichment, overexploitation, climate change and invasive species). This in turn enables us to map them against the business sectors and practices contributing to these pressures (*Table 5*).

**Table 5: Contribution of business sectors and practices to pressures on ecosystem services**

Pressure	Provisioning services	Regulating services	Cultural services	Supporting services
<b>Habitat change</b>	Conversion of land to agriculture and forestry, and intensification of agricultural production, has increased provision of food and timber, but with adverse impacts on some other services (e.g. fresh water). Development through urban and industrial	Coastal development affects coastal hazard regulation. Urbanisation and built development affects water regulating services, noise and soil quality. Agriculture, recreation, tourism, forestry practices increasing soil erosion. Agricultural	Development – urban, industry, energy and transport – affects valued landscapes and habitats and access to green space. Intensification of agriculture and forestry has impacted on landscape.	Agricultural expansion and intensification has impacted negatively on soils, nutrient cycling and water cycling. Forestry sector has damaged peatland soils through afforestation. Transport and

<b>Pressure</b>	<b>Provisioning services</b>	<b>Regulating services</b>	<b>Cultural services</b>	<b>Supporting services</b>
	expansion and energy and transport infrastructure has taken land from agricultural and forestry production.	intensification encouraging spread of pests and disease. Transport - impacts on noise. Agriculture, forestry, recreation - impact on soils.		construction developments have impacted on soils.
<b>Pollution and nutrient enrichment</b>	Pollution of water by agriculture, industry and the water sector has affected fresh water provision.	Air quality has been affected by emissions from energy, transport, agriculture and industry. Pollution by agriculture, energy and industry affects water quality	Pollution potentially impacts on cultural services by adversely affecting valued landscapes, species and habitats	Air pollution from industry, energy, transport and agriculture affect nutrient cycling, as does pollution from water sector (sewage sludge) and agriculture (animal wastes).
<b>Over-exploitation</b>	Over-exploitation of fish stocks has affected sustainability of fisheries sector and impacted marine environment. Over-abstraction of water in some areas by agriculture, industry and water sector has impacted on freshwater habitats and led to competing demands for water.	Extraction of peat for horticulture and energy has affected climate regulation.	Overexploitation potentially impacts on cultural services by adversely affecting valued landscapes, species and habitats	Agriculture and water sectors have affected water cycling through water abstraction.
<b>Climate change</b>	Climate change may impact on agricultural and forestry production and affect the provision of fresh water	Climate change impacts on a range of other regulating services.	Climate change potentially impacts on cultural services by adversely affecting valued landscapes, species and habitats	Climate change will have an impact on soils, water cycling, nutrient cycling and primary productivity.
<b>Invasive species</b>	Varroa destructor mite has impacted on honey production.		Invasive species potentially impact on cultural services by adversely affecting valued landscapes, species and habitats	

46. **Table 6** summarises how different sectors benefit from different ecosystem services. Agriculture, forestry, fishing, water and energy depend intimately on a range of provisioning, regulating and supporting services. Manufacturing industry depends on the provisioning services of ecosystems for its raw materials, while tourism, recreation and creative industries are strongly dependent on cultural services.

**Table 6: Business sectors benefiting from ecosystem services**

Sector	Benefits to sector from ecosystem services	Provisioning services	Regulating services	Cultural services	Supporting services
Agriculture	Food provision - dependent on range of regulating and supporting services which underpin productive potential of sector	X	X		X
Forestry	Provision of fibre - dependent on range of regulating and supporting services which underpin productive potential of sector	X	X		X
Fishing	Food provision – dependent on key regulating and supporting services	X	X		X
Food manufacturing	Dependent on food and fresh water provision	X			
Pharmaceuticals	New drugs often developed from genetic resources	X			
Other manufacturing	Depends on provision of water and raw materials	X			
Energy	Water and biomass				
Water	Depends on fresh water provision as well as regulation of water flows and quality, control of erosion, and supporting services that underpin these	X	X		X
Tourism and recreation	Depends on cultural services linked to landscape, biodiversity and sense of place. Benefits from local food and other produce. Dependent also on regulating services (climate, water quality and flows, natural hazard prevention). Field sports depend on provision of game and fish species.	X	X	X	
Creative, media and marketing	Benefit from cultural services delivered by ecosystems – wildlife, landscape and cultural heritage			X	
Financial services	Insurance depends on regulating services, especially natural hazard regulation		X		

47. Different ‘types’ of business opportunity have the potential to contribute to, and benefit from, changes in the delivery of ecosystem services (**Table 7**). Some, such as environmental technologies, have the potential to contribute to the enhancement of ecosystems, while others, such as tourism and other cultural services markets, mostly benefit from the delivery of services. However, there may be opportunities to enhance the delivery of ecosystem services by encouraging businesses that benefit from them to contribute to the enhancement of ecosystems (e.g. through visitor payback schemes in tourism and through product certification initiatives linked to sustainable management).

**Table 7: Links between Business Opportunities and Ecosystem Services**

Business opportunity	Potential to contribute to service delivery				Potential to benefit from service delivery			
	Provisioning services	Regulating services	Cultural services	Supporting services	Provisioning services	Regulating services	Cultural services	Supporting services
Environmental technologies	X	X	X	X				
Biodiversity offsets	X	X	X	X				
Product markets	X	X	X	X	X		X	
Payments for ecosystem services	X	X	X	X	X	X	X	X
Markets for cultural services			X				X	
Financial and legal services	X	X	X	X	X	X	X	
Ecosystem knowledge economy	X	X	X	X	X	X	X	X
Corporate ecosystem initiatives	X	X	X	X				

## **2.4 THE VALUE OF ECOSYSTEM SERVICES, LINKS TO BUSINESS**

48. The NEA provides a review of the economic value of the services delivered by UK ecosystems. Some of the services provided are traded in markets and have substantial market values. Examples are the provision of food and timber. Greening of these markets – to encourage production methods that enhance the management of ecosystems – offers

substantial market opportunities. Certification schemes, and other initiatives such as green public procurement, have the potential to enhance these markets.

49. Other services may not have direct markets but may have substantial value to people, businesses and society as a whole. Many of the regulating services fall into this category. The NEA shows that many of these services – such as climate regulation, water regulation and pollination – have substantial values to society. The NEA also demonstrates the substantial value of the health benefits provided by ecosystems, and of the cultural services relating to landscape and recreation. Capturing these benefits in markets has the potential to provide business opportunities.
50. Payments for ecosystem services (PES) provide a means of capturing these benefits and developing markets for them, hence encouraging their provision. For example, PES schemes could reward land management that enhances water quality and/or reduces incidences of flooding, or management of grassland to enhance pollination services. Where particular businesses benefit from these services (e.g. water companies), there is potential to organise PES schemes where the beneficiary pays for the services received. In other cases, such as for carbon storage and the enhancement of biodiversity and landscape, the benefits accrue to society as a whole, through provision of public goods. In these instances publicly funded PES schemes (such as agri-environment programmes) are justified (**Table 8**).

**Table 8: Market opportunities arising from ecosystem services**

Type of benefits	Market benefits	Non-market benefits	
		Private benefits – finite number of identifiable beneficiaries	Public good aspects – many beneficiaries
<b>Examples</b>	Food, timber	Pollination, water quality, flood management, recreation	Biodiversity, climate regulation
<b>Market opportunities</b>	Greening of existing markets	Creation of private markets	Creation of public markets
<b>Possible initiatives</b>	Certification, labelling	PES schemes, visitor payback	Public PES schemes (e.g. agri-environment)

**Box: Examples of Non-Market Values**

- Substantial but uncertain non-use values (of the order of £100's – 1,000's of millions) for conserving biodiversity in terrestrial, wetland, coastal and marine ecosystems.
- Carbon emissions from coastal margins loss: £82m p.a.
- Benefits of improvements to river water quality up to £1.1 billion p.a.
- Marginal value of coastal flood protection by wetlands £2,498/ha p.a. Total value up to £1.5 billion p.a.

**Box: Examples of Non-Market Values (continued)**

- Marginal amenity value of inland wetlands of £230/ha/yr and coastal wetlands of £1,400/ha p.a. Total wetland amenity value up to £1.3 billion p.a.
- UK-wide valuations for agricultural greenhouse gas (GHG) emissions (i.e. costs) estimated for all of the UK ranging from £4,286 million p.a. in 2004 to £13,409 million p.a. in 2060 (both calculated using Stern values for the UKCIP high emissions scenario). Within the above costs, emissions from peatlands are estimated at £130 million p.a. Total value of net carbon sequestered (i.e. benefits) annually by UK woodlands = £680 million
- English recreation: direct expenditure of £20.4 billion p.a. (UK-wide values may exceed £30 billion p.a. In addition, foreign visitors spend £ in the UK).
- Urban greenspace amenity: Valuations vary from losses of £1.9 billion p.a. to gains of £2.3 billion p.a. depending on policy scenarios.
- Other regulating and supporting services that have not yet been valued: Hazard regulation; Soil erosion; Pest and disease control in agriculture; Soil chemistry and organic matter development; Nutrient cycling; Water cycle regulation; Primary productivity for fisheries.

Source: UKNEA

## **2.5 ECOSYSTEM MARKET CREATION**

51. Ecosystem business opportunities depend on the possibility of creating or developing markets linking providers and beneficiaries of ecosystem services, or goods and services which contribute to the enhancement of ecosystems.
52. A barrier to the creation of markets for ecosystem services may be a lack of market representation of providers and/or beneficiaries. Where there are many potential buyers or sellers, creation of markets may depend on organising them to encourage collective provision or purchasing of services. Appropriate representation may be developed, either by forming new bodies (e.g. local farmers groups) or by adapting existing structures. The latter may arise where a business represents a set of potential purchasers for ecosystem services that are not part of its current commercial offer.
53. For example, a water company may have a number of business customers who want to purchase carbon offsets or flood risk reduction services. Such services may be available in the water catchment, but there is no functioning market, as individual transactions by businesses with the landowners are not efficient (in particular they would be subject to free-riding). The water company does not currently trade these services, but it holds a powerful position as a potential broker for new ecosystem markets in this respect. This is because it already has a business interaction with both the ecosystem service providers (as catchment management is relevant to part of its core business, water supply) and beneficiaries (whom are its customers). Establishing both these relationships from scratch would involve significant transaction costs.

## 2.6 SUMMARY OF ECOSYSTEM MARKET OPPORTUNITIES

54. **Table 9** presents a (non-exhaustive) long-list of business opportunities, organised by the above typology. This list builds on the initial long-list that we extracted from our analysis of the NEA, and includes additional opportunities generated by stakeholders, and which might also be supported by the NEA evidence.

**Table 9: A non-exhaustive long-list, derived from the NEA, of business opportunities that value and/or protect nature’s services**

Category	Business opportunities identified in or inferred from the NEA
1. Product Markets	Organic and sustainable food are identified as offering opportunities for more sustainable management of ecosystems
	Certification of food (e.g. meat, dairy) and timber products could encourage more ecosystem friendly products with benefits for woodland, grassland and other habitats
	Development of markets for sustainable fish (e.g. through conservation credits, certification, supermarket purchasing) would benefit marine ecosystems
	Potential to restore oyster beds to enhance sustainability of coastal ecosystems
	Markets for wild foods (venison, rabbits, game) could encourage sympathetic ecosystem management
	Low impact protein production (e.g. medieval fishponds produced large quantities of fish with relatively low impacts and inputs)
	Initiatives to encourage beekeeping and honey production could enhance pollination and other services
	Woodlands and grasslands offer opportunities for sustainable biomass production
	Opportunities to revive traditional forestry practices, skills and markets (e.g. coppicing), also reed beds (thatching)
	Conservation of genetic resources offers potential commercial opportunities, particularly in bioprospecting and biomimicry.
	Reduction of food waste, e.g. conversion to animal feed could save costs, create business opportunities and relieve pressures on agricultural ecosystems
	Horticultural development of UK native species, including peat replacements
	Relax regulations to allow food waste to be reused as animal feed.
	Sustainable (fair-trade/organic?) clothing markets. E.g. fair-trade business shirt was tried by M&S.
Assurance of ecosystem services impacts of business to business transactions.	
2. Offsets	<p>Including ecosystems in carbon offset schemes offers opportunities for sustainable management:</p> <ul style="list-style-type: none"> <li>• Peatland restoration and maintenance using the Peatland Carbon Code (in UK) and VCS (beyond UK).</li> <li>• Woodland creation, reinstatement or management of woodlands using the Woodland Carbon Code.</li> <li>• Blue carbon – develop methodologies and markets for carbon sequestered in saltmarshes and seagrasses.</li> <li>• Soil carbon and agricultural management practices. Farmers selling credits from retaining soil</li> </ul>

Category	Business opportunities identified in or inferred from the NEA
	carbon above their existing management obligations under existing incentive schemes.
	Biodiversity offset schemes could enhance ecosystems and relieve pressures caused by development and other impacts on habitats
	Biodiversity offsets could create opportunities for habitat/conservation banking and business-led ecosystem restoration schemes
	Nutrient neutral - some kind of cap and trade - minimising nutrient input on farms to extent possible but where certain level of nutrients needed, offsetting elsewhere. Need a very local implementation.
3. Payments for Ecosystem Services	PES could support the delivery of a wide range of ecosystem services (fresh water, water quality, management of floods and natural hazards, pollination etc.)
	Developing carbon markets for ecosystems could encourage sustainable management
	PES schemes could enhance role of ecosystems in flood management and enhancement of water quality
	PES schemes could promote managed realignment and watercourse management to prevent coastal hazards and flooding
	PES offer new revenue opportunities for land managers (e.g. farmers) and potential cost savings for buyers (e.g. water companies)
4. Environmental Technologies	Environmental technologies to reduce air, water and soil pollution offer important benefits to ecosystems. These cover pollution prevention schemes that deliver benefits through input substitution, a more efficient operation of processes and small changes to production plants (avoiding or stopping leakages and the like).
	Green infrastructure important for urban ecosystems (e.g. green roofs, drainage systems, recreational green space, trees to enhance air quality and noise control, landscaping), providing opportunities for developers
	Importance of technologies in mitigating impacts of primary production on ecosystems (e.g. enhanced agricultural and fishing technologies)
	Technology can help to develop new ecosystem products (e.g. biochemicals from forest products, wood fuel technology)
	Technology can enhance ecosystem management (e.g. machinery and techniques for habitat restoration, coastal management, wetland management)
	Role of media, including social networking and new media technologies, for engaging people with nature
	Environmental technologies in water sector - leakage, pollution control, flood management, constructed wetlands to improve water quality, river restoration
	Energy technologies have important impacts on ecosystems - opportunities for new energy technologies that could reduce environmental impacts (e.g. geothermal energy)
	Importance of technology for control of pests and diseases, invasive alien species
	Environmental technologies that will target novel pollutants (e.g. endocrine disrupting substances and nanoparticles).
	Production redesign to generate secondary outputs, and environmental technologies to separate and treat waste and use some components (i.e. plant compost).
	Digital technologies related to biodiversity and ecosystems for business (whether spatial planning or screening/diagnostics etc).
Environmental technologies to reduce impacts associated with transport and enhance 'localism' (local	

Category	Business opportunities identified in or inferred from the NEA
	value, access and proximity).
	Development of technologies for measurement, monitoring, instrumentation & assessment (traceability is an opportunity e.g. biometric tagging). There is also potential for remote sensing and data interpretation ('ground truthing').
	Technologies for noise and vibration control
	Environmental management and auditing technologies: formal systems of environmental management involving measurement, reporting and responsibilities for dealing with issues of material use, energy, water and waste
	Chain management tools and technologies to close material loops and avoid environmental damage across the value chain (from cradle to grave).
	New or environmentally improved products (goods) including household appliances (smart fridge), eco-houses and buildings.
	Nanotechnology has the potential to substantially benefit environmental quality and sustainability through Pollution prevention, Treatment & Remediation, Information applications.
	Low impact protein production (e.g. medieval fishponds produced large quantities of fish with relatively low impacts and inputs)
	Smart cities, featuring closed-loop systems, low impact protein production etc.
	Biotechnology (breeding, genetic markets, etc.).
	Distributed production of goods and services (e.g. drinking water production).
	Opportunities for leasing services (shifting from a product to a service focus).
	Gaming ecosystem technology as an opportunity for businesses
5. Markets for Cultural Services	Opportunities for sustainable tourism, including through certification and payback schemes
	Green health and exercise programmes offer potential for business provision
	Ecosystem based recreation (walking, fishing, shooting, birdwatching) offers market opportunities
	Charge for access to national parks and other green spaces and invest the income into ecosystem conservation.
	Consortium of neighbouring farmers collaborating to invest in conservation and open their farms for a fee for leisure and recreation.
	Multiple benefits from urban or urban-edge green space, e.g. Green Health Prescriptions to use city parks for physical + mental health - provision of green space for cultural services (e.g. recreation)
	Auction of urban-edge micro-landscape features to local community
6. Ecosystem Knowledge Economy	Knowledge development plays key role in sustainable ecosystem management - UK has strong reputation internationally
	R&D offers opportunities for sustainable market opportunities in agriculture, fisheries, forestry and water
	NEA illustrates strength of UK knowledge base and potential for development of ecosystem knowledge economy
	Knowledge underpins most of the other business opportunities (e.g. certification, environmental technologies, offsets, PES)
	Study to look at changes in patterns of work (e.g. home-working and local employment) to avoid energy and ecosystem impacts of commuting.

Category	Business opportunities identified in or inferred from the NEA
	<p>Opportunity for different utility companies to work together to create new business opportunities. E.g. water and gas companies have room for collaboration, because if customers use less water, then they use less industry. There are market opportunities (of packaged benefits for customers) arising from that.</p> <p>Make insurers separate out flooding premium in insurance costs, providing information to market</p>
7. Financial and legal services	<p>Financial services sector plays a key role in financing new business opportunities</p> <p>Sector also has a responsibility as a lender to other sectors involved in degradation of ecosystems</p> <p>Potential reputational benefits of enhancing impacts of sector on ecosystems</p> <p>Insurance sector will benefit from initiatives to reduce floods and natural hazards</p> <p>Potential role for insurance in PES schemes linked to water and natural hazard regulation</p> <p>Legal services required to support new interventions, including legislation, offsets and other market instruments</p> <p>Environmental bonds: Forestry or other conservation bonds underpinned by government.</p> <p>Green Investment Bank to look into funding green asset classes like bonds (beyond renewable energy).</p> <p>Financial product based on the Principles for Responsible Investment.</p> <p>Fund for support for SMEs to get new BES-friendly innovations to market.</p> <p>Green bonds applied to ecosystem services (e.g. forest bonds for pension funds)</p>
8. Corporate ecosystem initiatives	<p>NEA implicates wide range of business sectors in ecosystem decline</p> <p>Failure to address ecosystem impacts presents risks for business</p> <p>Reputational benefits and opportunities for market positioning through positive approach to addressing ecosystem impacts</p>
9. Other, including eco-taxes, levies, subsidies, grants, public procurement, cost savings, etc. (These may be considered enabling actions rather than 'types' of business)	<p>Agri-environment and woodland grant schemes have stimulated markets for ecosystem services</p> <p>Range of instruments (taxes, charges, tradable permits) offer opportunities for different ecosystems</p> <p>Market based instruments in water sector include appropriate pricing of water resources, metering of use, tradable quotas, fees, permits and subsidies</p> <p>Market instruments could encourage more sustainable transport and energy systems and reduce ecosystem impacts</p> <p>Many of benefits of ecosystem services are reflected in reduced societal costs, with potential savings to businesses - challenge is how to capture these</p> <p>More sustainable ecosystem management (including agricultural conversion) would reduce water treatment costs and generate overall net benefits</p> <p>Savings in healthcare costs resulting from enhanced ecosystems and their use by people</p>

## 3 OVERVIEW OF ‘TYPES’ OF OPPORTUNITIES FOR UK BUSINESS & ENABLING ACTIONS REQUIRED

55. In this section, we provide an overview of the eight ‘types’ of opportunities for UK business we have identified, based on: a) our analysis of the UK National Ecosystem Assessment, and b) team and stakeholder discussions and comments on relevant business opportunities supported by the NEA analysis.

### 3.1 *PRODUCT MARKETS*

#### 3.1.1 Introduction/definition

56. Markets in products more aligned with the conservation and sustainable use of ecosystems are the most developed and widespread set of actions so far taken by companies to secure business opportunities that promote beneficial outcomes for ecosystems. These range from robustly certified products through to less formal linkages that make connections between consumption choices and ecosystems.

#### 3.1.2 Scope of product market opportunities

57. Products include goods such as food, biomass and minerals consumed, processed and traded as consumer products.
58. Business opportunities in both existing and potential new markets embrace a wide range of economic sectors, but agriculture, forestry, ranching, fisheries, mining, energy, construction, real estate, manufacturing, and retail are particularly relevant.
59. These sectors are directly dependent on nature ranging from land take to raw materials and intermediate goods obtained through secondary and tertiary manufacturing processes. The evidence in the NEA and related literature points to the following as some of the potential business opportunities in relation to product markets that advance ecosystem-related goals.
- Products with reduced environmental impact, for example foods derived from organic agriculture.
  - Production systems following ethical and sustainability production standards (Fairtrade, Sustainable Agriculture Network, Soil Association and others).
  - Independent credible assurance of supply chains (certifications such as, FSC, Fairtrade, Rainforest Alliance).
  - Depletion (restoration) of fish stocks.
  - Bio-energy from forests, farms and grasslands.
  - Multifunction land management – combining farming and forestry and other land-uses with carbon capture leading to ‘low carbon’ products offered in markets.

- Sustainable fisheries – freshwater, marine and aquaculture.
  - Game hunting.
  - Wild food (meat and herbs).
  - Bee keeping which is particularly attractive in view of concerns about declining bee populations and its impact on pollination.
  - Restoration of Oyster beds.
  - Gene banks.
  - Bio-prospecting.
  - Mitigation of business environment (climate and biodiversity) foot prints.
  - Integrating sustainability in mining and related supply chains.
  - Restoration of degraded landscapes for premium housing.
  - Environment friendly waste disposal and management.
60. Markets for the above listed opportunities already exist and could be expanded. The size of their true potential must be determined by detailed feasibility studies relating to the specifics of each case.
61. Irrespective of the detail relating to different markets, it is clear that companies from primary producers to manufactures and retailers are under scrutiny and pressure to source in ethical ways. There is compelling evidence to show how this demand remains strong even during a period of economic difficulty. In order to garner confidence from non-governmental groups and customers there has been an increased focus on certification.
62. While much of the emphasis in certification schemes has been related to imports there are domestic sources of certified goods – for example wood certified by the Forest Stewardship Council and seafood by the Marine Stewardship Council.
63. Demand for ethical products, driven by campaign groups and willing consumers, has been quite strong in the UK and this presents a promising opportunity for the UK to be a leader in the development of certification. This could in part be built upon the elaboration of new schemes that could help to build domestic markets in, for example, more sustainable dairy and livestock products and wood fuel.
64. Certification has not only been harnessed as a means whereby ‘green’ consumers can be supplied with more sustainable goods, it has also provided the means whereby companies such as retailers can ‘edit’ consumer choice through supplying *only* products produced with the highest standards. To this extent certification can be a means to lever actions that go beyond the choices of individual consumers to enable entire sectors to improve their impact, and for particular companies to differentiate their brands, as B&Q did in committing to only stock timber products certified by the Forest Stewardship Council.

65. Certified products are not the only ones to have potential. Straight consumer choices away from, for example, peat compost to that based on non-peat material has been an important driver of change, even though no certification has been necessary.

### **3.1.3 Key enabling actions**

66. Greater clarity as to which certification and other standards deliver the greatest ecosystem benefits would help companies in a wide range of sectors to determine what is the best action they can take in relation to different ecosystem opportunities.
67. It is for example not clear which of the many product standards currently in vogue adequately address sustainability, which standards need to be adapted and what new standards, if any, are required for products or market segments not covered at the moment. A proactive generation and provision of relevant information is a key need especially where opportunities are latent or less known. The best practice schemes leading to the most sustainable products could be favoured through public procurement. This would send a strong leadership signal to the private sector.
68. There might also be some role for Government in convening key stakeholders to review the future of product certification for sustainability. This might be necessary because of the recent proliferation of labels and schemes that are in some cases leading to confusion among both consumers and businesses. It might be that some streamlining is possible.

## **3.2 OFFSETTING**

69. This section covers both carbon and biodiversity offsets, and considers stacking and bundling of different environmental offsets. Water quality 'offsets' were considered, but are better conceived as Payments for Watershed Services under section 3.3 on PES, below.

### **A. BIODIVERSITY OFFSETS**

#### **3.2.1 Introduction/definition**

70. Biodiversity offsets, which can be implemented through conservation banking, have featured in UK environmental policy for the last few years, including in the NEA. This section describes the NEA references, current Defra policy and practice, sources of information on international best practice, and summarises related business opportunities for the UK.

#### **3.2.2 Scope of biodiversity offsetting opportunities**

71. On its website, Defra defines biodiversity offsets as conservation activities designed to deliver biodiversity benefits in compensation for losses, in a measurable way, and states '*We think that biodiversity offsetting has the potential to deliver planning policy requirements for compensation for biodiversity loss in a more effective way*'. The Natural Environment White Paper committed that '*We will establish a new, voluntary approach to biodiversity offsets and test our approach in pilot areas.*'

72. This is now underway. In March 2012, Defra released guidance for offset providers and for developers that would like to use offsetting, an explanation of the guiding principles Defra has used in its approach to biodiversity offsetting, and technical support including an updated technical paper on the metric being used in biodiversity offsetting in the UK. Defra, Natural England and local authorities in six pilot areas have been working together since 2 April 2012 to test the biodiversity offsetting approach in pilots that will run until April 2014. The pilots will develop information and evidence that the government will use to decide whether to support greater use of biodiversity in England, and if so, how to use it most effectively.
73. Settings in which biodiversity offsets, including offsets delivered through conservation banks, could generate business opportunities not only in England, but in Wales, Scotland and Northern Ireland, appear throughout the NEA. For instance, Section 6.5.2 of the NEA notes that conservation planning requires the restoration of semi-natural grassland habitats and the creation of linked networks of semi-natural grasslands (e.g. the European Ecological Network and The Wildlife Trusts' "Living Landscapes"). This is one example of the issues raised in the NEA that link to biodiversity offsets, which could offer one driver for investment in such restoration. The designation of an ecologically coherent network of marine conservation zones (MCZs) is required by 2012, and some scientists and NGOs have recommended networks of 'closed areas' to promote the recovery of fish stocks (NEA section 12.5.2). This is another example of links to biodiversity offsets, which could be used to fund Marine Protected Areas, MCZs and closed areas. NEA section 27.2.3.5 describes the long use of incentives in the UK as an instrument to influence production, and more recently the advent of incentive schemes to conserve biodiversity in agricultural landscapes. Depending on the scope within EU law, it may be possible to amend UK incentive schemes to compensate farmers for delivering biodiversity offsets.
74. The UK should be able to learn not only from the modest existing experience on biodiversity offsets in England, but also from rapidly developing international best practice, based on long-standing and more recent regulated offset systems in over 30 countries (including, notably, Australia, the US, the EU, Brazil and South Africa) and voluntary measures by companies. Much of this international best practice has been captured by the Business and Biodiversity Offsets Programme (BBOP), a collaboration of 82 companies, government agencies, NGOs and financial institutions. In January 2012, BBOP released a Standard on Biodiversity Offsets, support by Defra among many other organizations<sup>9</sup>.

### **Key opportunities**

75. Biodiversity offsets offer a business opportunity to stimulate the creation of a range of new companies and new business models for existing companies (or non-profit organisations) to provide biodiversity offsets in the UK (see **Annex 1**, Opportunity T2.1, Biodiversity offsets, including through conservation banking).

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<sup>9</sup> [http://www.forest-trends.org/documents/files/doc\\_3078.pdf](http://www.forest-trends.org/documents/files/doc_3078.pdf)

76. This opportunity is essentially the creation of a new market, since (a) offsets are presently optional and are only just starting to happen in the UK, particularly in England, and (b) they are not delivered to an agreed standard by conservation banking companies or any other entities that can meet the standard.
77. An important part of this opportunity is that a set of new, small and medium-sized enterprises (including individual farmers) would evolve to meet a clear demand for offsets in the UK (which will require regulatory stimulus and clarity, see below).
78. In addition, this new market would create business opportunities for a range of supporting service providers, including: (a) environmental consultants (to advise developers on application of the mitigation hierarchy to minimise their offset needs and to design offsets); (b) one or more independent broker(s) to match developers needing offsets with conservation banking companies and other potential suppliers of offsets; (c) registry/ies to record offsets to provide legal certainty and ensure that 'credits' are not sold twice to different developers; (d) certifiers to monitor delivery of offsets either through bespoke arrangements or through conservation banks; and (e) financial services ranging from loans to start conservation banks to insurance products.
79. Current estimates for housing development alone (on the basis of 250,000 houses being required annually) suggest that a conservation banking market could generate £50-300 million per annum in credits (source: pers.comm. Tom Tew, Environment Bank). (Annual markets for biodiversity offsets aggregated globally are now in the order of US\$3bn, with projections to 2020 for mandatory offsets to reach over \$10bn. Source: Ecosystem Marketplace and TEEB.)
80. The potential for marine, aquatic and terrestrial ecosystems is considerable, since offsets are based on delivering 'no net loss' on a 'like for like or better' basis. This goes beyond current UK requirements and practice, and would result in developers taking responsibility for rectifying their footprints and contributing additional funding to deliver measurable conservation outcomes. The ecosystems that would benefit are those that are suffering impacts from development pressures. Ecosystem gain would include significant contributions to conservation investments in the UK, greater connectivity, avoided fragmentation, and landscape level planning to avoid impacts on high conservation value areas and to devote offset investments to these areas.
81. This approach is most relevant to sectors with significant residual impacts on habitat, such as aggregates, mining, house building, infrastructure development, port development, etc.

### **3.2.3 Key enabling actions**

82. The principal enabling action that is required is (soft) regulation or unambiguous policy interpretation by government that clarifies that biodiversity offsets are necessary in defined circumstances, and that establishes a framework for implementation to a particular standard, including through conservation banks. A further enabling action would be support for a brokering system which can provide national, regional and local choice against desired spatial delivery, and can provide transparency and ease of purchase of credits and management of contracts with those providing offset sites, all of which would reduce risk.

## **B. CARBON OFFSETS**

### **3.2.4 Introduction/definition**

83. Measured in metric tons of carbon dioxide-equivalent (CO<sub>2</sub>e), carbon offsets are reductions in emissions of carbon dioxide or equivalent greenhouse gases made in order to compensate for or to offset an emission made somewhere else. Markets for carbon offsets comprise compliance markets and voluntary markets. Compliance markets are those for offsets needed to meet regulated systems such as obligations of Annex 1 Parties under the Kyoto Protocol, and entities liable under the EU Emissions Trading Scheme. The considerably smaller voluntary carbon marketplace covers transactions of carbon credits/offsets that were not purchased to be surrendered into a regulated carbon market, and includes offsets purchased with the intention to re-sell or retire to meet carbon neutrality goals or other environmental claims.<sup>10</sup>

### **3.2.5 Scope of carbon offsetting opportunities**

84. The scope of these markets is driven by the manner in which implementation of regulatory systems such as the Clean Development Mechanism and ETS evolves. A number of opportunities for specific carbon offset systems have been identified for EMTF to consider (see opportunities ***T2.2 Soil carbon enhancement via changed grazing practices, T2.3 Peatland carbon code, Annex 1A***).

## **C. STACKING AND BUNDLING**

85. A number of the environmental markets established over the last few years have entailed payments for a single ecosystem service. As companies grapple with responsibilities for carbon, water, biodiversity, they are increasingly calling for streamlined processes and standards and integrated multiple benefit models.
86. The desire to accumulate payments for different services from the same land gives rise to both risks and opportunities. Aggregating the services paid for runs the risk of some being undersold or double counted and involves reconciliation of different metrics. A bigger danger is that losses of some ecosystem services could be masked by gains in others. Yet there are significant advantages of tackling the aggregation of ecosystem service markets are many: making investments in conservation achieve multiple benefits as cost effectively as possible, and consolidating efforts in connected ecological networks rather than focussing on a proliferation of fragmented areas selling single ecosystem services.
87. There are two principal ways to layer different ecosystem services within a landscape: bundling and stacking. ‘Bundling’ refers to combining more than one ecosystem service credit type from the same area of land into a single credit type. For instance, US wetland mitigation banking credits offer a bundle of services. The client pays for a wetland credit (needed to comply with regulation), but the wetland intervention generates multiple

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<sup>10</sup> Ecosystem marketplace

ecosystem services, from biodiversity and climate regulation, to water quality and quantity.

88. By contrast, 'stacking' refers to payments for a variety of different ecosystem services from the same area of land or sea. Historically, the manner in which different ecosystem service markets can be planned and credits sold from a landscape has not been considered prior to markets springing up. Rather, an individual market is planned (e.g. wetland banking), then the financial, legal and market issues associated with determining other markets in the same landscape are added on later, often giving rise to uncertainty and confusion. Considerably more work needs to be done to establish the policies to guide potential conflicting principles for bundling or stacking ecosystem service markets (e.g. additionality versus optimising revenue per hectare).
89. If EMTF takes forward more than one approach within the broad rubric of offsets and payments for ecosystem services, it may be advisable to commission some research on bundling and stacking and to offer advice to Defra on a range of options that would stimulate business opportunities in this area while strengthening and not undermining protection of the ecosystems concerned.
90. Whatever the structure through which biodiversity offsets are developed, it is important to position this set of tools as last resort measures to address residual impacts, after all other means to protect ecosystem values and to avoid and mitigate damage from development have been exhausted. This will be important if offsetting is to inspire public support and confidence.

### **3.3 PAYMENT FOR ECOSYSTEM SERVICES (PES)**

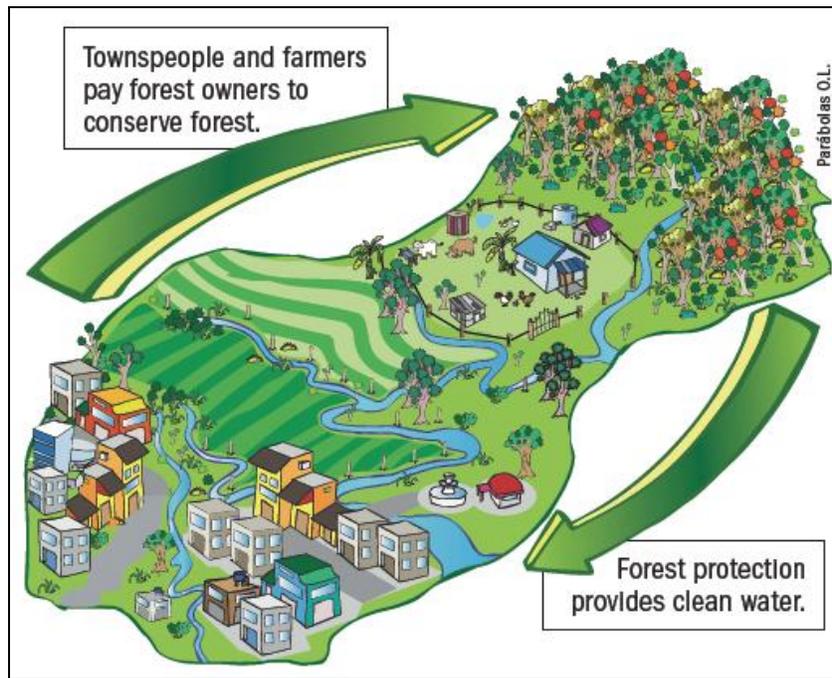
#### **3.3.1 Introduction/definition**

91. The term Payments for Ecosystem Services (PES) is often used to describe a variety of schemes in which the beneficiaries, or users, of ecosystem services provide payment to the stewards, or providers, of ecosystem services – see **Figure 1**. Unlike other incentive-based mechanisms, PES aims to identify the stakeholders that benefit from a specific ecosystem service (or 'bundle' thereof) and creates a mechanism through which a payment can be made to the provider of the service. PES is therefore based on a theoretically straightforward proposition: pay individuals or communities to undertake actions that increase levels of desired ecosystem services.
92. A review of the literature suggests that the following five principles should underpin any arrangement labelled PES:
  - stakeholders enter into a PES agreement on a voluntary basis;
  - payment is made by the beneficiaries of ecosystem services (individuals, communities and businesses or governments acting on their behalf);
  - payments are made directly to ecosystem service providers;
  - ecosystem service benefits are additional or over-and-above business-as-usual (i.e. land managers must go beyond regulatory compliance) or, if current benefits are

demonstrably threatened, then the status quo is at least maintained and continued service provision therefore guaranteed (either way an agreed baseline is a prerequisite); and

- payment is conditional on the delivery of ecosystem service benefits (although these may be assumed to occur with the implementation of certain proxy land use practices).

Figure 1: Payments for Ecosystem Services<sup>11</sup>



93. Having said this, there are numerous examples of 'PES-like' schemes based on several of these principles. PES programmes can be developed at a wide variety of spatial scales, from large government-financed PES schemes, such as Environmental Stewardship, an agri-environment scheme, to smaller user-financed schemes, in particular those at the scale of individual catchments.

### 3.3.2 Scope of PES opportunities

94. Research for Defra suggests that the most promising areas for the emergence of new user-financed PES schemes are in relation to water quality and water resources (including both water supply / storage and flood risk attenuation). Existing schemes include the Sustainable Catchment Management Plan (SCaMP), a partnership between United Utilities and the RSPB and Upstream Thinking, a partnership between South West Water and Westcountry Rivers Trust. PES schemes such as these can promote the provision of multiple benefits, for example, in relation to biodiversity, carbon sequestration, landscape value and recreational access; this, in turn, raises the possibility of establishing 'layered'

<sup>11</sup> Conservation International (2010). *Climate change & the role of forests: A community manual*

PES schemes whereby different buyers purchase different services generated by the same area of land. Further investment in PES schemes focused primarily on water quality and water resources could help kick start the emergence of more complex multiple-benefit PES schemes.

95. Other opportunities for user-financed PES are starting to emerge. The Woodland Carbon Code, for example, provides an opportunity for organisations to invest in woodland creation and buyers are able to report the associated carbon reduction in their greenhouse gas emissions statements. A Peatland Carbon Code (see Opportunity T2.3, **Annex 1A**) is also under discussion which would provide the framework for companies to purchase carbon credits to support the restoration of degraded peatlands. Other opportunities include the further development of visitor payback schemes (VPS) which allow visitors to contribute to landscape management through a small donation; for example, to support the Vital Uplands ecosystem services pilot project, Nurture Lakeland developed a pilot VPS in the Bassenthwaite Catchment within the Lake District National Park.
96. There is also an opportunity to reform national PES schemes, for example Environmental Stewardship, which pays about £400 million a year to farmers and land managers in return for more environmentally sensitive farming (this is an example of a government-financed scheme whereby government buys ecosystem services on behalf of users, in this case the wider public). Potential opportunities include targeting 'ecosystem hotspots' for payments and the use of inverse auctions (whereby potential ecosystem service sellers submit bids indicating the minimum payment they are willing to accept for the provision of an ecosystem service). Planning for ecosystem services on a strategic basis may also identify particular spatial areas as a target for ecosystem restoration and there may be an opportunity to effectively marry public (agri-environment scheme) and private (user financed PES and biodiversity offset) monies in pursuit of increased service provision.

#### **Summary of PES opportunities based on the NEA analysis**

97. Some key opportunities relating to PES have been identified both through the analysis of the NEA and through the workshop with key stakeholders:
  - Carbon sequestration PES as an 'Allowable Solution' (Opportunity T3.1, **Annex 1A**): private developers would contribute to carbon sequestration through purchasing Allowable Solutions Certificates generated through measures such as woodland creation or peatland rehabilitation on the basis that, in order to deliver zero carbon homes, it will be generally difficult to mitigate all emissions on site and off-site Allowable Solutions will be a necessity.
  - Peatland Carbon Code (Opportunity T2.3, **Annex 1A**): this would provide the framework for companies to purchase carbon credits to support the restoration of degraded peatlands.
  - 'Layered' PES (Opportunity T3.2, **Annex 1A**): whereby multiple buyers purchase ecosystem services provided by the same parcel of land. For example, for a coastal habitat, a private company might buy the carbon sequestration benefits while a wildlife NGO pays for the biodiversity benefits and the Government purchases the flood risk alleviation benefits on behalf of local beneficiaries.

- Catchment Trust Funds: whereby ecosystem service beneficiaries from across a catchment would pay into a central fund with monies disbursed to relevant enhancement projects.
- Flood risk PES: the Government is keen to encourage additional local investment in flood and coastal erosion risk management, and give areas at risk a bigger say in the action taken which could potentially include PES.
- Water storage PES: as an alternative to reservoirs, South West Water for example is interested in exploring opportunities for payments for water storage.
- Further development of the Woodland Carbon Code: to encompass biodiversity as well as carbon for example (so-called 'charismatic carbon').
- Land Carbon Code: a broad code for all land taking inspiration from the Woodland Carbon Code and the mooted Peatland Carbon Code (note this would obviously encompass agricultural land).
- Localised PES: for example, PES schemes for housing developments whereby residents pay a levy for nature reserve management; relevant examples include the levy that Merton Council collects for properties within a three quarter-mile radius of Wimbledon Common which is passed onto the Wimbledon and Putney Commons Conservators (WPCC) for the upkeep of the Common.

### 3.3.3 Key enabling actions

98. The Natural Environment White Paper includes several commitments in relation to PES: *"We will publish an action plan in 2012 to expand schemes in which the provider of nature's services is paid by the beneficiaries, after undertaking a full assessment of the challenges and barriers. We will introduce a new research fund targeted at these schemes and will publish a best practice guide for designing them"*. Three PES pilots are currently being funded and a Best Practice Guide for PES is in preparation. Other 'enabling actions' in relation to PES that were discussed at the workshop included:
- Promoting data availability (essential for establishing baselines for PES schemes)
  - Exploring the links between water company activities and the interests of the insurance industry together with the role of Ofwat
  - Integrating ecosystem services within Cost-Benefit Analysis (CBA) particularly within the water industry
  - Identify 'catalysts' for PES scheme emergence; these could be in the form of individuals but posts would require funding
99. The key enabling actions for encouraging a greater uptake of user and government financed PES schemes are set out below:
- Develop a best practice guide for payment for ecosystem services
  - Further develop the evidence base
  - Promote open source databases
  - Establish a PES Capacity Building Group

- Identify and develop 'honest brokers'
  - Learn by doing
  - Establish a PES seed fund
  - Mobilising PES finance
  - Evaluate the effectiveness of PES
100. Of these, further developing the evidence base and identifying and developing 'honest brokers' are particularly important. With regards to the evidence base, it will be important to increasingly establish the efficacy of different land management interventions in terms of ecosystem service delivery. Building the evidence base around cause-and-effect will help reassure buyers that they are getting what they pay for and sellers that they are indeed providing the requisite service(s).
101. With regards to brokers, the PES literature consistently emphasises the importance of 'honest brokers' in developing PES programmes and the identification and development of independent and credible intermediaries is likely to be key to developing schemes. Brokers can fulfil a number of roles including: helping sellers assess an ecosystem service 'product' and its value to prospective buyers; assisting sellers with establishing relationships and rapport with potential buyers; enabling sellers get to know potential buyer(s); assisting with proposal development; and administering PES programmes.

### **3.4 ENVIRONMENTAL TECHNOLOGIES**

#### **3.4.1 Introduction/definition**

102. Grounded on our understanding of how the world functions, technology plays a critical role in ecosystem change and ecosystem protection. Environmental technologies are defined as all technologies preventing or treating pollution, managing resources or using them more cost-efficiently. This wide definition (in accordance with the EU) is based on the OECD definition for environmentally sound technologies.
103. This contrasts with an older approach of environmental technologies, covering traditional end-of-pipe technologies: water supply and sanitation, waste treatment, air pollution abatement, soil remediation, monitoring techniques. The new approach, now widely accepted, covers also cleaner production processes in all industrial sectors, energy-saving techniques and renewable energies, and also new products and services and business methods having less impact on the environment than their current alternatives.<sup>12</sup>
104. The range of possible technological solutions is therefore broad, encompassing for example direct interventions to ecosystems such as river restoration or wetland construction, as well as more systemic changes which can yield diverse and substantial yet

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<sup>12</sup> Examples include hydrogen and fuel cells, clean production processes, alternative energy sources, CO2 sequestration, bio-fuels and bio-refineries, energy efficiency, information technologies for sustainable growth, clean and efficient transport, water technologies, soil and waste management, and environmentally friendly materials.

sometimes not immediately obvious ecosystem benefits (e.g. less resource-intensive production processes).

### **3.4.2 Scope of environmental technologies opportunities**

105. There is currently very broad scope for environmental technologies that will enhance ecosystems and the services they provide in the UK. The opportunities that are explicit within, or that we have inferred from, the NEA, are as follows:

- Environmental technologies to reduce air, water and soil pollution offer important benefits to ecosystems; these cover pollution prevention schemes that deliver benefits through input substitution, a more efficient operation of processes and small changes to production plants (avoiding or stopping leakages and the like).
- Green infrastructure important for urban ecosystems (e.g. green roofs, drainage systems, recreational green space, trees to enhance air quality and noise control, landscaping), providing opportunities for developers
- Importance of technologies in mitigating impacts of primary production on ecosystems (e.g. enhanced agricultural and fishing technologies)
- Technology can help to develop new ecosystem products (e.g. biochemicals from forest products, woodfuel technology)
- Technology can enhance ecosystem management (e.g. machinery and techniques for habitat restoration, coastal management, wetland management)
- Role of media, including social networking and new media technologies, for engaging people with nature
- Environmental technologies in water sector - leakage, pollution control, flood management, constructed wetlands to improve water quality, river restoration
- Energy technologies have important impacts on ecosystems. Opportunities for new energy technologies that could reduce environmental impacts (e.g. geothermal energy).
- Importance of technology for control of pests and diseases, invasive alien species
- Environmental technologies that will target novel pollutants (e.g. endocrine disrupting substances and nanoparticles).
- Environmental technologies to reduce impacts associated with transport and enhance 'localism' (local value, access and proximity).
- Production redesign to generate secondary outputs, and environmental technologies to separate and treat waste and use some components (i.e. plant compost).
- Digital technologies related to biodiversity and ecosystems for business (whether spatial planning or screening/diagnostics etc).
- Development of technologies for measurement, monitoring, instrumentation & assessment (traceability is an opportunity e.g. biometric tagging). There is also potential for remote sensing and data interpretation ('ground truthing').

- Technologies for noise and vibration control.
  - Environmental management and auditing technologies: formal systems of environmental management involving measurement, reporting and responsibilities for dealing with issues of material use, energy, water and waste.
  - Chain management tools and technologies to close material loops and avoid environmental damage across the value chain (from cradle to grave).
  - New or environmentally improved products (goods) including household appliances (smart fridge), eco-houses and buildings.
  - Nanotechnology has the potential to substantially benefit environmental quality and sustainability through pollution prevention, treatment & remediation, information applications.<sup>13</sup>
  - Low impact protein production (e.g. medieval fishponds produced large quantities of fish with relatively low impacts and inputs).
  - Smart cities that would feature closed-loop systems, low impact protein production.
  - Biotechnology (breeding, genetic markets, etc.).
  - Distributed production of goods and services (e.g. drinking water production).
  - Opportunities for leasing services (shifting from a product to service focus).
  - Gaming ecosystem technology as an opportunity for businesses.
106. The NEA analysis notes that environmental technologies have often focused on solving single issues and have failed to consider broader implications of the application for other locations or ecosystems. Adopting a systems approach, accounting for unintended consequences and promoting solutions that can simultaneously deliver multiple benefits are considered here as business opportunities. Two examples are considered here (**Annex 1**):
- Opportunity T4.1: this refers to water reuse technologies and their potential to deliver environmental and business benefits.
  - Opportunity T4.2: this involves the redesign of production processes or application of new technologies in order to generate secondary outputs that can serve as valuable inputs into other processes, rather than waste. This opportunity compares favourably against the waste minimisation approach that has thus far dominated industrial practice.

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<sup>13</sup> **Pollution prevention** (Nanoscale information technologies for product identification and tracking to manage recycling, remanufacture, and end of life disposal of solvents). **Treatment & Remediation** ( for example, enhancement of Iron Treatment Walls...) **Information** ("Sense and Shoot" Approach to Pollution Treatment: Nanosized zinc oxide (ZnO) "senses" organic pollutants indicated by change in visible emission signal. The ZnO "shoots" the pollutants via photocatalytic oxidation to form more environmentally benign compounds. Sensing capability means that the energy-consuming oxidation stage only occurs when the pollutants present. Multifunctionality and "smartness" is highly desirable for environmental applications).

107. Both opportunities (1.6 and 4.1 in Annex 1), which focus on closing the loop in production activities, cut across all ecosystems and ES, through the preservation of natural resources, pollution reduction and energy savings. They are applicable to a very wide range of sectors, with significant possibilities for developing synergies among different actors, given the diversity of materials and applications. The business benefits are very substantial and include savings on the purchase of resources and the discharge of waste streams, revenue generation from the sale of outputs of production and reduction of business risks associated with the availability of resources or future regulatory changes that can increase costs or restrict operations.
108. The UK is a technologically advanced country, but opportunities for improved practices in relation to environmental technologies abound. Environmental technologies are widely applicable, scalable, and relevant to a wide range of industries and sectors, and their market potential is equally vast and varied. Realising this potential, however, rests on innovation and developing a more integrated approach to decision making that takes wider systems into account rather than just linear processes.
109. Critical to the development of more sustainable business models that will properly evaluate the potential of environmental technologies to deliver ecosystem benefits is developing a better way of effectively accounting for all costs and benefits associated with current practices.

### **3.4.3 Key enabling actions**

110. Key enabling policies and actions for encouraging a greater uptake of environmental technologies are further presented. The origin of EU policies on environmental technologies comes back to the European Summit of Heads of States and Government in Goteborg in 2001, where the EU adopted its Strategy on Sustainable Development<sup>14</sup>. The second source of momentum in favour of eco-innovation comes from the Lisbon Strategy for Growth and Job, which sets the European Agenda since its adoption in 2000<sup>15</sup>. A series of enabling actions for environmental technology business opportunities that can provide a decent return while also making a significant contribution to protecting and valuing nature's services are presented below (their relative importance will depend on the type of sector and the context of the application):

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<sup>14</sup> To support the Sustainable Development Strategy, the Commission was asked to explore the potential of environmental technologies to become a win-win solution, contributing to both environmental protection and economic growth. Preparatory works, including expert meetings and a public consultation, paved the way for the Environmental Technologies Action Plan to be adopted in early 2004. When the Sustainable Development Strategy was revised in 2005, the Commission's review highlighted the role of eco-innovation and called for the cooperation of the EU and Member States to boost the markets for environmental technologies.

<sup>15</sup> In 2005, the review of the Lisbon Strategy highlighted three main themes for the European strategy, one of them being 'knowledge and innovation for growth: facilitate innovation, the uptake of ICT and the sustainable use of resources.' Since the launch of ETAP, about €1.4 billion has been awarded to environmental technology projects under the 6th Framework Programme. Under the 7th Framework Programme it is estimated that up to 30% of the €32 billion budget will address environmental technologies.

- R&D of technology/innovation.<sup>16</sup>
- Factoring in environmental costs to show that apparently cheaper alternatives which take less account of the environment may be, in fact, most costly to society.
- There is a need for data/information services, and the management of information on ecosystem state and the opportunity for exchanging such information. Facts and figures are needed in order to make a business case for environmental technology opportunities.
- Putting appropriate business models in place to properly internalise environmental costs and account for ecosystems services benefits. Only the calculation of these will justify the application of environmental technologies that are normally prohibitively expensive.
- Use valuation methods to understand where in the value chain risks and opportunities from impacts and dependence on biodiversity and ecosystem services stem, and then address the priority areas.
- Technological 'solutions' often suffer from inappropriate problem definition. Broad stakeholder engagement works in favour of good understanding.
- Prices and value of nature should determine technological choices but metrics are a problem – for example, it is difficult to value the protective services of a salt-marsh. There is a need to combine technology with nature's services.
- Create platforms (regional) for stakeholder engagement and interaction for identification of synergies and opportunities of cooperation across sectors.
- Showcasing of best practice per type area of application and communication of the conditions under which applications can be successful.
- Reconciliation of existing sources of information on environmental quality and resource use, and filling in of gaps. Regional/local information is critical.
- Companies could help customers make sustainable choices.
- Streamline planning consents as an incentive for use of environmental technology (e.g. water companies using floating solar panels on reservoirs)
- Ensure access to finance for development and launch of environmental technology. The use of "*demand pull*" to promote innovation, with "Lead markets" that can also act as a stimulus for demand, need to form part of a *systematic and coordinated activity on the demand-side is needed*. Green Public Procurement, market based-

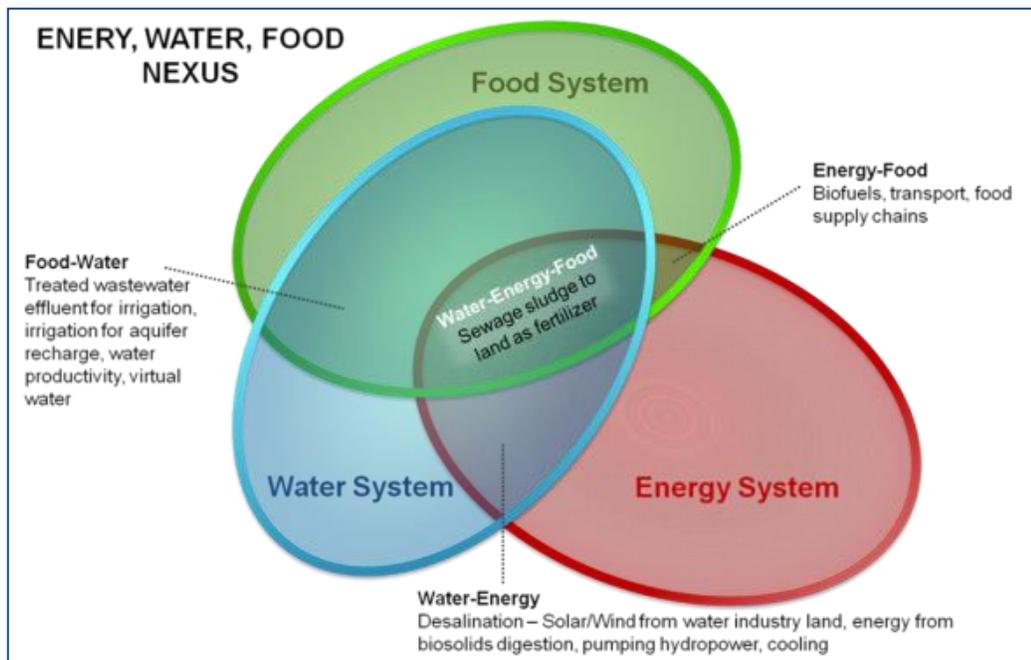
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16 New or improved environmental technologies are needed to reduce the environmental impact of human activities, protect the environment and manage resources more efficiently and to develop new products, processes and services more beneficial for the environment than existing alternatives. Research will target in particular: technologies preventing or reducing environmental risks, mitigating hazards and disasters, mitigating climate change and the loss of biodiversity; technologies promoting sustainable production and consumption; technologies for managing resources or treating pollution more efficiently; technologies for the sustainable management of the human environment including the built environment, urban areas, landscape, as well as for the conservation and restoration of cultural heritage.

instruments, financing for business to switch to green technologies, raising awareness in business and with consumers, all need to be intensified.<sup>17</sup>

- Prices and value of nature should determine technological choices but metrics are a problem – for example it is difficult to value the protective services of a salt-marsh. There is a need to combine technology with nature’s services. Create platforms (regional) for stakeholder engagement and interaction for identification of synergies and opportunities of cooperation across sectors.
- Application of decision-making tools in the context of the water, food and energy nexus (see Figure 2, below) rather than sector approaches (multi-criteria analysis).

**Figure 2: Energy, water, food nexus**



- To deliver significant benefits, the rate at which environmental technologies are deployed and taken-up must increase significantly. Large environmental gains can be made by taking-up environmental technologies that already exist on the market, but the problem is that many remain in niche markets. One example is the energy efficient light bulb still only accounts for less than 3% of European market share of light bulbs. New driving forces have to be put into place to encourage the diffusion and take up of eco-innovations on a broad scale.
- Change business processes and/or payment and incentive systems, for example payment for provision of outcomes (e.g. final products) not volumes of raw material.

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17 For example, the EIB and the EC are developing a joint Risk Sharing Finance Facility (RSFF), with the objective to improve access to debt financing, for private and public sector research that has a high risk profile. €2 billion will be available for projects falling within the FP7 themes and the mechanism will allow the European Investment Bank to grant loans up to €10 billion.

- There is need for greater verification of environmental technologies. Evidence suggests that lack of verification continues to hamper access to new environmental technologies, particularly where there are no protocols for the testing of these technologies. An example of efforts in this direction is the work on *Environmental Technologies Verification Systems* that is progressing both in the States and the EU.
  - Revising aspects of policy and legislation that inherently discourage opportunities for innovation, for example the ‘waste’ classification of materials, labyrinthine policy frameworks that discourage and complicate technology application as in the case of anaerobic digestion.
111. In general, strategic partnerships between the public and private sector, the academia, and the civil society are required, and in order to reduce the risk in investing on research, creating a better environment for the increase of private investments for these technologies.

### **3.5 MARKETS FOR CULTURAL SERVICES**

#### **3.5.1 Introduction/definition**

112. The NEA argues that UK ecosystems shape and are shaped by the culture of the country. It also alludes to potential market and business opportunities in the provision of cultural services. This section seeks to summarize such notable business opportunities highlighting a few that appear more promising.

#### **3.5.2 Scope of markets for cultural services opportunities**

113. NEA defines cultural services as the environmental settings that give rise to the cultural goods and benefits that people obtain from ecosystems. Prominent among such environmental settings are domestic gardens, informal and formal green and blue spaces, the countryside and national landscapes and seascapes. This report scans business opportunities both in existing as well as new markets involving cultural services from UK environmental settings in the related sectors of rural diversification, tourism, recreation, health and amenity. Also related are opportunities in the housing and construction sectors. Establishing feasibility of any of the potential opportunity would be beyond the scope of this study. The effort here therefore is to summarize the notable business opportunities arising from UK ecosystems in this context.
114. Cultural ecosystem services can potentially be relevant to the entire UK economy, and the images associated with ecosystems can be used to market any product. However, key markets are those with a direct reliance on ecosystems for the quality of their product (e.g. water industry) or strong connections with ecosystems to differentiate themselves within their market (e.g. tourism locations). A further notable opportunity may exist in the health sector, where the potential role of ecosystems in promoting public health outcomes is increasingly well understood. This is linked to all types of ecosystem services, but includes cultural connections to outdoor environments that provide motivation. Thus key UK markets for ecosystem services are tourism, recreation and creative industries, with health also being important.

115. The market for tourism is growing globally and within UK, and there is an obvious trends toward nature based sustainable tourism:

- According to one estimate, in 2000, UK habitats received 3.2 billion visits estimated at over £10 billion. Another estimate puts English recreation alone at 2.858 billion visits with direct expenditure of £20.4 billion; UK wide values would exceed £30 billion.
- People are travelling more for leisure and other purposes (estimated at more than 40% of all travel). 74% UK people consider green space very important;
- Housing in the proximity of national parks and water bodies is more expensive indicating the scarcity of supply for businesses to address.
- Art, entertainment and recreation were estimated to have a turnover of £91 billion in 2010. Accommodation and food services would be another £68 billion.

116. From the above, cultural services are obviously important for UK. They depend on healthy ecosystems, are often compatible with environmental sustainability, and support large-scale employment. The substantial values associated with cultural services are captured in the UK NEA.

117. Some notable business opportunities related to cultural services mentioned in or inferred from the NEA are listed below:

- Catering to the increasing per capita travel experience and demand.
- Reversing the decline in countryside environmental settings especially in proximity to urban areas.
- Mitigating the deterioration in quantity and quality of green spaces in urban areas.
- Optimizing the economic potential of protected landscapes and seascapes.
- Catering to and harnessing the demand for amenity living in suburban landscapes.
- Harnessing the potential of environmental settings for recreation, leisure and tourism...as one of the most enduringly popular locations.
- Provision of amenity housing around green and blue spaces at premium prices.
- Establishing outdoor Health Clubs mirroring indoor fitness clubs.
- Cultural education (ecological education for schools, guided tours of rare birds, rare breeds).
- Business in Philanthropy: several million people support environmental philanthropy with NGO membership fees and volunteering time.
- Visitor payback schemes.
- Private land trusts and conservation easements: TEEB forecasts a global market of \$20 billion by 2020.
- Arts, recreation and entertainment: Turn over £ 91 billion in 2010.
- Accommodation and food services for visitors. New potential in local business diversification and local foods.

- Tourism credit cards.
  - Tourism Value Chain Finance.
  - Opportunity in attaching cultural values to other ecosystems services (e.g. carbon and biodiversity offsets).
  - UK is better known for its economic, cultural and historic interest, less for its natural endowment. The enhancement and promotion of naturally attractive areas in the UK has potential for attracting more tourism revenue.
  - Smarter travels, e.g. Sustrans example of National Cycle Network, Barclays London Cycle service
  - Local business diversification including local food, tourism
  - Wildlife and game tourism, e.g. hunting on farmlands.
  - Water sports and recreation
  - Medical tourism; therapeutic horticulture, eco-therapy.
118. Except for businesses dependent on cultural services from healthy ecosystems such as nature-based tourism that would be interested in mitigating their risks in the supply chains, most opportunities in this area would be by way of growing businesses and developing new markets and products. Investments in cultural services are amenable to quick and steady sustainable returns over the long term.
119. Real life examples exist of realizing the listed opportunities both within the UK and abroad. While the total domestic market is significantly large, it remains fragmented. Globally too, despite being one of the largest employers and principal foreign exchange earner for many nations, tourism and by extension most other cultural services, tend to be delivered through small and medium-sized enterprises. The focus of harnessing business potential from cultural services will therefore naturally be among small and medium-sized enterprises.
120. Tourism in UK is a mature market. Yet the market for several cultural services, apart from the obvious ones such as ecotourism, is little developed. For example 75% of English people consider local green places important and 50% visit them at least once a week, but these are not commonly regarded as 'services'. Many of UK's cultural environmental amenities have strong public good (and sentiment) characteristics. Therefore, another major opportunity here is for public private partnerships.
121. Perhaps the most concrete major business opportunity is in amenity housing. There is evidence of a growing number of urban dwellers out-migrating to rural or suburban areas for amenity living and economic enterprise on rural landscape. Also, NEA evidence demonstrates increments to house price values based on local environmental amenity, part of which is cultural services.
122. There is also a strong case in exploring the opportunities inherent in better distributing UK cultural ecosystem services as a leisure attraction. The specific opportunities would be in better promoting the nation's natural assets domestically and abroad and in creating new attraction in economically lagging areas of the country to attract increased domestic

tourism. This could be combined with restoration of both terrestrial and marine ecosystems, waste disposal and carbon capture. Markets for cultural services on private land trusts and easements that combine a multitude of amenity services (eco-therapy, medical tourism, rural green health clubs, cultural tourism and carbon capture) is potentially possible.

123. **Annex 1** provides some more specific and detailed examples of promising opportunities, notably Opportunity T5.1 ‘Optimizing the ecological and economic benefits of Sustainable Tourism’. Opportunity T3.5 ‘Ecosystems restoration’ and Opportunity T1.4 ‘Woodland enhancement through a larger market for wood fuel’ are also relevant.

### **3.5.3 Key enabling actions**

124. The NEA recognizes that cultural services are a less well measured product of ecosystems. Some cultural goods linked to ecosystems are hard to understand in monetary terms, but in future their shared currently non-monetary values will need to be understood. With consistent data collection nationally, eventually, it should be possible to assign a monetary value to some if not all of these services, and to establish the concept that environmental settings provide valuable cultural services that are worth investing in. This is a long-term project for the government and society.
125. In the short and medium term, government will need to create a policy and support framework for the private sector to invest. The first stage of this will be a policy and knowledge framework in which business can make informed decisions. Cultural services and that markets they represent are small-scale investments with relatively low risks.

## **3.6 FINANCIAL AND LEGAL SERVICES**

### **3.6.1 Introduction/definition**

126. Financial and legal services are enabling activities across the entire economy. They therefore are relevant to ecosystem service business opportunities in the ways they are relevant to all sectors: for example financial services enable capital to be invested in productive activities, and legal services enable security of property rights. They are both a cross-cutting aspect of ecosystem service business opportunities, and a specific sector in themselves in that the services provided can generate new markets (e.g. through innovations in transactions).

### **3.6.2 Scope of financial and legal services opportunities**

127. There are some aspects of financial and legal services that are particularly relevant to ecosystem services. For example:
- the substantial values of existing ecosystem service markets mean that optimal choices of financial instruments can influence the level and nature of service provision substantially (e.g. the design of agri-environment payment systems);
  - the combined public and private good nature of many ecosystem services means financial and legal instruments that can reflect this (e.g. public-private partnerships) may be needed.

128. Business opportunities exist in innovations to financial and legal services in order that they better serve the characteristics of ecosystem service markets. Such innovations can:
- reduce transaction costs in existing markets (e.g. by providing for over the counter purchases of verified carbon-offset products),
  - adapt to the different characteristics of ecosystems in their design (e.g. that ‘seed investment’ in ecosystem service markets (like offsets and PES) and their legal structures need to take into account the timescales over which ecosystem goods and services will respond to investments in their management).
  - lead to development of new markets (e.g. through the concept of biodiversity business investment, both in financial markets through the diversification of ethical investment funds, and in local environmental management through investments in pro-biodiversity business models).
129. There is significant UK potential in this aspect of ecosystem markets, which stems from, inter alia, the UK’s strength in service industries in general, including in financial and legal services, and natural environment industries including consultancy services. Novel combinations of skills from these existing UK industries are required to make the most of business opportunities (e.g. developing green bonds, providing long-term investment vehicles for ecosystem-based investments). Ecosystem markets utilising financial and legal services will be strongly influenced by availability of information.
130. Actions in financial and legal sectors are unlikely to lead directly to major improved outcomes for UK ecosystems in isolation. However, they can provide important enabling actions for all ecosystem enhancements. In some cases they will provide necessary conditions for opportunities to be fully exploited.
131. Financial and legal services are relevant to all the business opportunities and examples identified from the NEA. For example:
- policy and scientific actions can enable a UK peatland-carbon market, but actions using legal and financial services (e.g. providing robust trading platforms) will be required for it to achieve its maximum potential
  - the role of financial services in ecosystem markets will be important when there is a greater time lag between expending resources to enhance ecosystem services, and those enhancements being realised by beneficiaries.
  - legal services may play an important role in ecosystem markets that require novel definitions of property rights (e.g. in the form of land easements for biodiversity offsets).

### **3.6.3 Key enabling actions**

132. The key enabling activities for encouraging greater development of financial and legal services for ecosystem markets include:
- Translating existing financial services that reflect combined public-private values (e.g. public-private partnerships, public backed equity investments or loan conditions that reduce investment risk) to ecosystems – develop potential forms of agreement;

- Encouragement/mandating of corporate reporting of ecosystem services dependencies and impacts;
- Improving indices and indicators used to communicate performance on ecosystem services to financial institutions and business, including through ISO certification of relevant processes used to generate them;
- Further develop the evidence base.

### **3.7 ECOSYSTEM KNOWLEDGE ECONOMY**

#### **3.7.1 Introduction/definition**

133. Ecosystems provide opportunities to develop knowledge-based businesses providing high quality employment and growth opportunities. The UK plays a leading role internationally in ecosystem related knowledge and is the first country to have published a national ecosystems assessment.
134. There is an opportunity to build on this knowledge base and to strengthen collaboration between business and knowledge based institutions in order to maximise business opportunities relating to ecosystems. The aim would be to position the UK as an international leader in knowledge-based goods and services contributing to the protection of ecosystems and the sustainable use of ecosystems and their services. This could build on existing initiatives to maximise the opportunities for the green economy from the UK ecosystems knowledge base.

#### **3.7.2 Scope of ecosystem knowledge economy opportunities**

135. This would be a new initiative building on and developing the existing knowledge base on ecosystems in the UK and promoting new business opportunities through collaboration between business, higher education and research institutes. The UK already has numerous knowledge based businesses focusing on ecosystem related issues – the intention would be to encourage further business growth focusing on the UK knowledge base.
136. This is a broadly based opportunity that could have a number of different elements:
- Research and knowledge development relating to ecosystems and their services;
  - Skills and training initiatives, including positioning UK as an international centre of excellence;
  - Research and development focused on business opportunities that enhance ecosystems and benefit from the sustainable use of ecosystem services;
  - Business & higher education collaboration and knowledge transfer networks;
  - Development and application of the knowledge required to underpin other ecosystem market opportunities (e.g. certification, PES, offsets etc).
137. This opportunity will create business opportunities itself (in research, training, R&D, consultancy etc) as well as supporting other ecosystem based business opportunities (including most of the other ecosystem market opportunities identified by the NEA and

relevant to the EMTF). This it provides both a growth opportunity as well as an enabler for other ecosystem market opportunities.

### **3.7.3 Key enabling actions**

138. Key enabling actions include:

- Further development of UK ecosystems knowledge base, including through UK NEA follow-on;
- Development of process for business to business assurance on ecosystem services impacts;
- Support for knowledge networks and arrangements for higher education and business collaboration;
- Application of R&D grants and incentives to ecosystem market opportunities;
- Promoting the UK internationally;
- Requiring/encouraging strong business reporting of biodiversity and ecosystem services impacts;
- Examining and developing knowledge required to underpin other ecosystem market opportunities, therefore setting out an action plan for knowledge based ecosystem market opportunities.

## **3.8 CORPORATE ECOSYSTEM INITIATIVES**

### **3.8.1 Introduction/definition**

139. For the purposes of this report, corporate ecosystem initiatives cover those actions that companies are already voluntarily taking, and which may not be covered in the categories set out above. These different activities have been driven by a number of factors, including the need to enhance or protect a brand, to meet consumer demand, manage supply chain issues or simply because of the desire among management to 'do the right thing'. More recently some companies have also identified strategic and systemic risk arising from ecosystem degradation and are taking actions to understand what these risks are and what might be done to mitigate them.

### **3.8.2 Scope of corporate ecosystem initiative opportunities**

#### **Support for projects and 'good causes'**

140. Numerous companies have donated either money or help in kind to assist ecosystem-based conservation activities. For example British Airways implemented a programme to assist nature conservation, while Tesco worked with RSPB to help improve the conservation status of the Skylark. Marks and Spencer recently supported a programme to help the recovery of pollinating insects.

141. No direct business return is generally linked to such activities, and for the most part the main business driver is reputational enhancement. Such activities are generally one-off initiatives that don't link into longer-term programmes.

### **Action in supply chains**

142. Often driven by market pressures, media exposure or consumer demand, some companies have looked into their supply chains in attempts to understand and manage the impacts that their businesses are linked to.
143. One of the first ecosystem-based issues to emerge in this respect was in relation to wood and paper, and this in turn led to the emergence of the first multi-stakeholder programme to agree standards and processes to encourage more sustainable ecosystem management in the form of the Forests Stewardship Council. B&Q was a leading company in this area.
144. In recent years there has been an increase in the number of initiatives geared toward the more sustainable production of commodities ranging from fish and palm oil to soya, sugar, cocoa, coffee, tea and fruits. This is exemplified by Unilever's leadership in putting the tea industry on the path of sustainability, Nesspresso's pursuit of integrating sustainability and productivity under its triple AAA program, Nestle's plan to sustain farm productivity alongside sustainability, and Mars's interest in understanding the effects of climate change on its supply chain. These have led to a range of outcomes ranging from strict certification schemes to informal agreements between suppliers and buyers focussed in large part on security of supply and mitigation of risks in the supply chain. These initiatives have great potential to understand the companies' environment footprint and to highlight and address the broader impacts of consumption and production patterns on ecosystems. For many products, there is further potential for sustainable production and consumption initiatives to increase their focus on ecosystems and biodiversity alongside other priorities such as reducing greenhouse gas emissions.
145. There are already many examples of the sustainability commitments of large multinationals and retailers positively influencing policies of traders in their supply chains. Rio Tinto's leadership position of net-positive-benefits to biodiversity in all their operations amplified the support to no-net-loss of biodiversity by other companies. Recent changes to Nestle's sourcing policies for palm oil saw a major transformation in the thinking of their suppliers. As activity in ecosystem markets grows, more business to business transactions can be expected to pay attention ecosystem services impacts. This will require more effort in ensuring these impacts are well measured and communicated, and in turn should link to more detailed coverage of ecosystem services in CSR reporting, and in commercial risk assessments and business strategies. An example of this kind of activity are the Equator Principles, adopted by a series of large banks, which include requirements to offset impacts on biodiversity that in general, go beyond minimum requirements. Banks adopting this standard not only see this a good business practice with respect to the natural environment, but also a proxy measure of a responsible attitude to the social and environmental impacts of business, and therefore a sign of good risk management.

### **Expanding consumer choice**

146. Some companies have set out to offer consumers more choice in terms of the ecological credentials of the products they sell. For example there have been ranges of peat-free compost offered alongside alternatives that are linked to the destruction and degradation of raised bogs while 'dolphin-friendly' tuna has been sold next to products which make no such claim.

147. Often driven by consumer demand, boycotts and pressure from non-governmental groups, a more recent discussion has emerged which is based on the notion of 'choice-editing'. This idea embraces the notion of companies making the 'right' choice for consumers to the extent that *only* ecologically sound products are on offer, rather than a range that embraces both good and bad, and which it is up to the consumer to discriminate between. For example some food retailers now sell only those seafood products certified by the Marine Stewardship Council, thereby removing reliance on consumer choice as a driver of more sustainable outcomes.
148. There are evidently opportunities in this arena for brand differentiation and, through that, garnering reputational advantages in highly competitive markets.

#### **Other voluntary actions**

149. Some companies have embarked on ambitious ecosystem-related activities because of the personal passion and commitment of senior leaders.
150. For example Taylor's of Harrogate launched an ambitious programme to slow down tropical deforestation and sought to get other companies involved through the idea of a United Bank of Carbon. Innocent, known for its smoothies, has been led by its founders into ambitious environmental programmes, especially in relation to the procurement of the fruit and vegetables from which the company's products are made. In both cases a strong moral case lies behind the actions being taken.
151. Policy-makers could reward these kinds of behaviours through different public bodies preferentially procuring products from companies leading in these ways.

#### **Multi-sector strategic initiatives**

152. During the last couple of years, and driven by a flurry of high-level activity in various forums, there has been a focus on the strategic risks posed by ecosystem degradation and the possible remedies that might be available to mitigate such risks.
153. Such high-level initiatives are presently underway on several tracks:
- One is through the Consumer Goods Forum, where there is a focus on the more sustainable production of a range of key commodities, including palm oil, beef and soya. UK-based multinationals are among the leaders in this process.
  - The University of Cambridge Programme for Sustainability Leadership (CPSL) and its Natural Capital Leaders' Platform is looking at how to reduce risks to companies through partnerships between government and private sector actors, for example in the process leading to Rio plus 20.
  - The WBCSD, Meridian Institute and WRI are working in partnership to help companies appreciate the connections that exist between the health of ecosystems and the business bottom line. This awareness-raising exercise is intended as a basis from which action programmes might be conceived and implemented.
  - WBCSD, ERM, IUCN, PWC are working together to enable more effective Corporate Ecosystem Valuation (CEV). This is deemed important due to the challenges that accompany a more resource-constrained world.

154. In terms of the specific opportunities identified in **Annex 1** which could assist in building activities under this heading several are relevant, but given the extent to which many corporate ecosystem initiatives are linked to supply chains the clearest linkages can perhaps be seen in moves toward more effective certification (see Opportunity T1.1 in **Annex 1**).

### **3.8.3 Key enabling actions**

155. In order to help these kinds of ‘bottom-up’ initiatives coming from the private sector to thrive, expand and evolve, a number of enabling actions can be developed by the public sector and policy-makers.

156. One is to adopt procurement rules that favour companies offering ecosystem-beneficial products and services. This could include hospital food, certified timber and alternatives to peat.

157. Another positive action would be to forge public-private sector dialogues on how to harness the best tools to meet ecosystem-related goals. The Task Force to which this process will report is one such example.

## 4 SPECIFIC BUSINESS IDEAS, SUGGESTIONS FOR FURTHER WORK

### 4.1 A CATALOGUE OF 40 IDEAS

158. Building on the long-list of business opportunities extracted from our analysis of the NEA (**Table 9**), applying innovative thinking within the study team, and through stakeholder consultation at our workshop and mailing out of our discussion paper with an invitation to submit ideas, we have collated a catalogue of 40 ideas presented as outline proposals for potential specific business opportunities (**Annex 1**), 20 generated by the study team (**Annex 1A**), 20 by external stakeholders (**Annex 1B**) (the latter are rather less developed given the workshop time constraints).
37. Our catalogue of ideas is by no means exhaustive, but is designed to be illustrative in demonstrating the range of opportunities that could exist, should the correct enabling frameworks be put in place.
38. The catalogue is organised according to the above typology presented in **Part 3**. For example, under ‘product markets’, we suggest opportunities in relation to: better certification; moves to enable the recovery of fisheries; an expanded market for sustainably produced wood-fuel; redesign of packaging so that it becomes an energy source.
39. Any one opportunity may relate to more than one ‘type’; we have therefore allocated each to the ‘type’ for which it has greatest affinity, but also identified (in **Annex 1**) to which other types each opportunity has some affinity.
40. For each idea, we provide: (1) a brief description of the opportunity, (2) mention of which business sectors or types might be implicated, (3) a rough estimate of the potential size of the market, (4) an indication of the potential benefit to ecosystems, (5) a brief assessment of what actions might be needed to make the opportunity work in practice, and (6) suggestions for further EMTF research on the opportunity.
41. In **Attachment 1**, we present a more detailed analysis of 15 of the ideas generated by the study team. This includes consideration of a range of characteristics of delivery of ecosystem services of relevance to the creation of markets that protect and value nature – such as scale, the kind of market failure involved, property rights, and the distribution of providers and beneficiaries of nature’s services. (It was not possible in the time available to carry out this level of analysis for all of the team ideas, or for the 20 ideas submitted by stakeholders.)
42. **Table 10** below provides an overview of the catalogue of 40 ideas and indicates where these may be found, in outline version in **Annex 1A** (team-generated ideas) and **Annex 1B** (stakeholder-generated ideas) and in elaborated version in **Attachment 1** (15 of the 20 team-generated ideas).

**Table 10: Summary of catalogue of ideas for business opportunities: (A) Ideas generated by study team\***

No.	BUSINESS IDEA	Short version		Long version
		Annex 1A	Annex 1B	Attachment 1
<b>1. Product markets</b>				
T1.1	Expanding the reach and value of sustainability certification	X		X
T1.2	Global Centre of Excellence for Ecosystem Services Certification	X		X
T1.3	Enhanced productivity of fish stocks	X		no
T1.4	Woodland enhancement through a larger market for wood fuel	X		X
T1.5	Designing packaging as fuel	X		X
<b>2. Offsets</b>				
T2.1	Biodiversity offsets, including through conservation banking	X		X
T2.2	Soil carbon enhancement via changed grazing practices.	X		X
T2.3	Peatland carbon code	X		X
<b>3. PES</b>				
T3.1	Carbon sequestration PES as an 'Allowable Solution'	X		X
T3.2	Layered PES	X		X
T3.3	Baselining ecosystem services provision	X		X
T3.4	Ecosystems restoration	X		X
<b>4. Environmental technologies</b>				
T4.1	Water reuse technologies	X		X
T4.2	Production redesign for generating secondary outputs (SOs)	X		X
<b>5. Cultural services</b>				
T5.1	Optimizing the ecological and economic benefits of Sustainable Tourism	X		X
<b>6. Financial &amp; legal services</b>				
T6.1	Reducing risk for insurers through investment in green infrastructure	X		no
T6.2	Developing environmental bonds as vehicles for investment in nature	X		no
<b>7. Ecosystem knowledge economy</b>				
T7.1	Developing the UK Ecosystems Knowledge Economy	X		X
<b>8. Corporate ecosystem initiatives</b>				
T8.1	Business to business ecosystem services assurance	X		no
T8.2	Assurance of corporate reporting activity	X		no
<b>9. Other including incentives, subsidies, grants</b>				
	none			

\* Idea T2.3 was developed by external stakeholders at the request of the study team

**Table 10: Summary of catalogue ideas for business opportunities: (B) Ideas generated by stakeholders**

No.	BUSINESS IDEA	Short version		Long version
		Annex 1A	Annex 1B	Attachment 1
<b>1. Product markets</b>				
S1.1	Developing new market opps from organic farming		X	
S1.2	Conservation Grade - nature-friendly farming		X	
S1.3	Making the most of UK biomass woodlands		X	
S1.4	Trees help us breathe		X	
S1.5	Green gateway' initiative for micro-clusters (accommodation, catering...)		X	
S1.5	Woodland management cooperatives		X	
S1.7	Ecofuel based on farm CO2 production (airfuel synthesis)		X	
S1.8	Smarter showers		X	
S1.9	Waste as a product/resource		X	
S1.10	Product certification to green supply chains & promote data sharing		X	
<b>2. Offsets</b>				
	<i>none</i>			
<b>3. PES</b>				
S3.1	Promote and capitalise on local concern for & use of the natural environment		X	
<b>4. Environmental technologies</b>				
	<i>none</i>			
<b>5. Cultural services</b>				
	<i>none</i>			
<b>6. Financial &amp; legal services</b>				
S6.1	Subnational rainforest bonds		X	
<b>7. Ecosystem knowledge economy</b>				
S7.1	What is sustainable development		X	
S7.2	Market intelligence		X	
S7.3	ES performance standard setting, confirmity, registration & administration		X	
S7.4	Citizen science		X	
<b>8. Corporate ecosystem initiatives</b>				
	<i>none</i>			
<b>9. Other including incentives, subsidies, grants</b>				
S9.1	Red tape reduction for market innovation		X	
S9.2	Green innovation purchasing trial		X	
S9.3	The city model		X	
S9.4	Eco-enterprise development		X	

## **4.2 SOME 'MORE PROMISING' IDEAS AND SUGGESTIONS FOR FURTHER EMTF RESEARCH WORK TO TAKE THESE FORWARD**

159. We highlight here 12 ideas which we believe show particular promise both in terms of short- to medium-term market potential, and in terms of potential benefit to UK ecosystems. We have ranked and present these ideas in order of their potential, as judged by the team. However, we would stress this is a very tentative ranking and that further reflection would be required to validate such ranking.
160. The exclusion of other **Annex 1** ideas from those highlighted here does not necessarily mean they hold less promise. We urge EMTF to give due consideration to each of the opportunities presented in **Annex 1**.
161. As it happens, all but one of the ideas highlighted in this section were generated by the study team; indeed, on the whole, ideas generated by the study team received strong support at the stakeholder workshop. The omission of stakeholder-generated ideas from those highlighted here does not necessarily mean that they are less valid, and to some extent reflects the fact that we had no time to explore them in further detail.
162. The 12 ideas highlighted here offer a balance between those which might be taken forward largely by business alone, and those which might also require enabling action by government, in terms of policy and/or regulatory measures. Given the fact that nature's services are in many cases public goods, and that current markets do not capture the value of many of these public goods, the development of markets and related business opportunities will in many cases inevitably entail policy signals and/or regulatory measures – much as such signals and measures were required to create carbon markets. We intend here policy signals and regulatory measures that create business opportunity and stimulate (not stifle) economic growth, while also delivering ecosystem benefits.
163. For each of the 12 ideas presented here, we indicate why we like it, and outline what further work EMTF might undertake to take it forward, with a view to enabling EMTF to formulate robust recommendations to the Secretaries of State for Business, Innovation and Skills, for Energy and Climate Change, and for Environment, Food and Rural Affairs. For more detail on possible further research, see the relevant proposals in **Annex 1** and **Attachment 1**. **Annex 1** and **Attachment 1** also contain suggestions for further research in relation to most of the other proposals for potential business opportunities not highlighted here.
164. Many of the business ideas identified in **Annex 1** are linked and the pursuit of various sets of linked proposals might deliver synergies in terms of both market potential and ecosystem benefit. For example, development of business opportunities on offsetting and PES would stimulate business opportunities in the ecosystems knowledge economy, and vice versa. Further analysis of such potential synergies might be a profitable element of any further EMTF work.
165. Our suggestions for further EMTF research work presented below, in **Annex 1**, and in **Attachment 1**, might also inform research and knowledge exchange work under a possible

second phase of the Valuing Nature Network (currently under preparation) and under the recently launched UK National Ecosystem Assessment follow-on phase,<sup>18</sup> the overall aim of which is to further develop and communicate the evidence base of the UK NEA and make it relevant to decision and policy making at different spatial scales across the UK.

166. Our 12 ‘more promising’ ideas, in order of ranking, are as follows:

**Rank =1: BIODIVERSITY OFFSETS, INCLUDING THROUGH CONSERVATION BANKING (Opportunity T2.1 - Offsetting)**

**What is it?** The opportunity is to stimulate the creation of a range of new companies and new business models for existing companies (or non-profit organisations) to provide biodiversity offsets in the UK, by moving from the current voluntary approach to a mandatory regime.

**Why we like it?** Already being piloted (on a voluntary basis) in the UK, it is a market waiting to happen and could deliver cost-savings to developers (see Annex 1A, T2.1, box 3); would require only soft regulation (a requirement to purchase credits to offset residual impacts in the Section 106 agreement – see Annex 1A, T2.1, box 6); and would deliver significant resources – particularly as the economy returns to growth - to ensure no net loss, and indeed net gain, of biodiversity and related ecosystem services.

**What might EMTF do next?** Develop, with legal advice, wording that might be used in Section 106 agreements requiring developers to purchase credits for residual impacts; further develop and articulate the business case for mandatory vs voluntary offsetting; and identify specific policy intervention(s) needed to stimulate a viable market for offsets.

**Rank 1=: PEATLAND CARBON CODE (Opportunity T3.2 – Offsetting/PES)**

**What is it?** Development of a peatland carbon code to provide a transparent, verifiable framework for companies to purchase carbon credits to support restoration and re-wetting of degraded peatlands. Consequent carbon savings could then be sold on the voluntary carbon market. Should government recognise peatland in its greenhouse gas accounting procedures, they could also be presented in company reports as part of their CR initiatives.

**Why we like it?** Logical next step for the carbon market, in line with recent global and EU trends towards regionalisation of carbon market. Strong market potential in UK. Potential for UK to develop leadership position in such markets, export services. Would deliver significant resources to restore peatlands which are among the UK’s most degraded habitats.

**What might EMTF do next?** (1) Support further development of the code, focusing on business interests; this might include meetings with key business sectors to explore interest, and work towards the establishment of registries and brokers. (2) Explore scope

<sup>18</sup> <http://uknea.unep-wcmc.org/NEWFollowonPhase/tabid/123/Default.aspx>

for government to recognize peatland in its greenhouse gas accounting procedures – a move which would catalyse market expansion. (3) Explore the market potential for application of the GEST approach to all peatland vegetation types across all regions/countries that have degraded peatlands.

**Rank 3: WOODLAND ENHANCEMENT THROUGH A LARGER MARKET FOR WOOD FUEL (Opportunity T1.4 – Product Markets)**

**What is it?** A business opportunity to meet growing demand for woodfuel and wood-burning stoves from UK woodlands.

**Why we like it?** Builds on current trends, already recognised as important (e.g. Forestry Commission has developed a Woodfuel Implementation Plan 2011-14); could lead to better woodland management and potentially further woodland creation; investments affordable for producers and consumers. There are potentially a lot of new rural jobs that could be created here too.

**What might EMTF do next?** Scope potential supply and demand, assess appropriate scale over which to organise local markets, assess what might be done by government to help enhance demand and develop the supply chain. Look at ways to link owners of small woodlands to markets. Find some light-touch standard, perhaps in partnership with NGOs, to encourage sustainable management.

**Rank 4: DEVELOPING THE UK ECOSYSTEMS KNOWLEDGE ECONOMY (Opportunity T7.1 – Ecosystems Knowledge Economy)**

**What is it?** Ecosystems provide opportunities to develop knowledge-based businesses providing high quality employment and growth opportunities. The UK plays a leading role internationally in ecosystem related knowledge and is the first to have published a national ecosystems assessment. There is an opportunity to build on this knowledge base and to strengthen collaboration between business and knowledge-based institutions in order to maximise business opportunities. The aim would be to position the UK as an international leader in knowledge-based goods and services that help value and/or protect nature's services. This could build on existing initiatives to maximise the opportunities for the green economy from the UK ecosystems knowledge base.

**Why we like it?** The UK is home to some of the best universities in the world, has a large professional services sector, its expertise in conservation and ecosystems is very strong, and the environmental sector is expected to be critical for developing a low carbon economy. Given our relative strengths it seems logical to further invest in the ecosystems knowledge economy and increasingly sell ecosystem-related services globally.

**What might EMTF do next?** Further elaboration of types of opportunity, key players, potential actions and arrangements to stimulate this opportunity.

### **Rank 5: LAYERED PES (Opportunity T3.3 - PES)**

**What is it?** In layered PES schemes, different ecosystem services (ES) which arise from the same area of land are sold to different buyers. On a small scale this would involve community groups, local businesses, the local authority and other interested parties purchasing those ES which they are interested in from a local resource (e.g. a river). On a larger scale, it could involve reforming the existing grant system (Environmental Stewardship, England Woodland Grant Scheme) to improve effectiveness. Government financed PES are currently 'bundled' and there is an opportunity to 'un-bundle' and re-structure these schemes to facilitate private investment in particular ecosystem services. In addition, provision of grants could be made conditional on the provision of ES and different ES could be bought by different public and private users. In this way private equity could be leveraged alongside public money for nature's services.

**Why we like it?** Offers potential to provide a flexible mechanism for different beneficiaries to buy into and influence PES schemes. Can build on and complement public funding, notably agri-environment measures. Offers potential to deliver sustained ecosystem services to wide range of business sectors. Considerable benefit to wide range of ecosystems. Steps will be needed to avoid socially regressive outcomes, however, for example in helping to avoid lower income groups being excluded from natural areas.

**What might EMTF do next?** Research into different buyers of PES and the services they would pay for; policy research to define a framework to enable layering and to combine public and private PES schemes.

### **Rank 6: CARBON SEQUESTRATION AS AN 'ALLOWABLE SOLUTION' (Opportunity T3.1 – PES/Offsetting)**

**What is it?** Government announced in 2007 that all new homes will be zero carbon from 2016. Offsite 'Allowable Solutions' will be needed to meet this requirement. This could in part be achieved by permitting developers to buy 'Allowable Solutions Certificates' generated by carbon sequestration through woodland creation or peatland restoration.

**Why we like it?** Offers a means to meet an existing government commitment, help homebuilders to deliver this commitment, benefit corporate and SME farm and woodland owners and related service providers, and enhance woodland and peatland ecosystems, including in ways that might help to reduce flooding risks.

**What might EMTF do next?** Explore with Government departments (CLG, Defra, DECC) and bodies such as the Zero Carbon Hub and the Forestry Commission, the possibility of including carbon sequestration projects centred on the natural environment as 'Allowable Solutions'.

### **Rank 7: EXPANDING THE REACH AND VALUE OF SUSTAINABILITY CERTIFICATION (Opportunity T1.1 – Product Markets)**

**What is it?** The opportunity is to sustain and grow the market for sustainably produced products, and to expand the cover of sustainability assurance to sectors or segments

currently not covered

**Why we like it?** Would reduce producer compliance costs and provide them price premiums, enhance production and security of supply, strengthen ability of intermediaries to meet client demands, allow retailers to earn consumer loyalty and maintain and grow market share. Under the right regime of sustainability standards and assurance or certification systems, companies could earn credits that may be traded or used to mitigate their own carbon and biodiversity footprints. In addition, there would be opportunities for business in skills development and participation in the knowledge market around sustainability assurance.

**What might EMTF do next?** Scope potential for a new standards system that takes into account land-use potential. Articulate the UK business case in terms of the current and potential ES services best amenable to certification, corresponding market size.

### **Rank 8: OPTIMIZING THE ECOLOGICAL AND ECONOMIC BENEFITS OF SUSTAINABLE TOURISM (Opportunity T5.1 – Markets for Cultural Services)**

**What is it?** – Opportunities include: make green and blue spaces more accessible; enhance quality and experience of recreation; better distribute visits from domestic and international tourism; invest tourism income in host ecosystems; provide amenity housing; restore ecological sites of tourism interest; to promote existing attractions; create new sustainable tourism infrastructure; better promote UK natural and cultural endowments internationally; assess and address travel footprints in UK; developing nature-based health tourism.

**Why we like it?** Very large market and growing trend towards nature based sustainable tourism. According to one estimate, in 2000, UK habitats received 3.2 billion visits estimated at over £ 10 billion. 74% UK people consider green space very important, but far fewer engage in significant outdoor activity representing significant untapped market potential. Potential for significant benefit to ecosystems if carefully managed.

**What might EMTF do next?** Review and strengthen valuation of ES in relation to nature-based tourism. Scope feasibility of various opportunities.

### **Rank 9=: GLOBAL CENTRE OF EXCELLENCE FOR ECOSYSTEM SERVICES CERTIFICATION (Opportunity T1.2 – Product Markets)**

**What is it?** Creation of a global centre of excellence that sells professional services that foster best practices in certification of products that benefit ecosystem services.

**Why we like it?** This would reinforce the UK's position in the expanding certification market (contributing to Opportunity T7.1 – Ecosystems Knowledge Economy, ranked 4 above) and encourage certification uptake by UK (and non-UK) companies, to the benefit of UK and global ecosystems. Could also help communicate to consumers the benefits of certification.

**What might EMTF do next?** Scope/define the business case more clearly, assess scale of ecosystem services suitable for certification and not currently covered by certified

markets, assess strengths and weaknesses of UK as a centre of excellence, scope size of domestic and global markets, investment and supply potential.

**Rank 9=: WATER RE-USE TECHNOLOGIES (Opportunity T4.1 – Environmental Technologies)**

**What is it?** The development and application of technologies to increase re-use of water at the level of individual (or local groups of) businesses.

**Why we like it?** Could deliver considerable business cost savings and income generation, enhanced water self-sufficiency for businesses. Would also alleviate water scarcity, reduce pollution, water extraction and energy consumption. Wide range of potential technologies available. In line with Water White Paper 2011. Considerable benefit to freshwater and coastal ecosystems.

**What might EMTF do next?** Research into the current UK context and how it can be improved in order to achieve the appropriate balance of regulatory, economic, technological and socio-political conditions.

**Rank 11: REDUCING RISK FOR INSURERS THROUGH INVESTMENT IN GREEN INFRASTRUCTURE (Opportunity T6.1 – Financial & Legal Markets)**

**What is it?** Recent years have seen large-scale losses to the insurance industry as a result of extreme weather, such as flooding. Extreme events are becoming more common, and could eventually create a systemic challenge to an industry that is based in large part on the assessment of risk based on past events. As new circumstances emerge in relation to the more frequent occurrence of extreme events, it might be that insurers could reduce their exposure through the enhancement of green infrastructure, such as woodlands, coastal wetlands or upland peat bogs.

**Why we like it?** Investment could significantly reduce risk of damage to insured assets, allowing insurers to reduce premiums while maintaining profits. Could deliver substantial resources for restoration in particular of upland watersheds and lowland floodplain ecosystems. In line with current government interest to develop green infrastructure, in particular in relation to flood risk reduction.

**What might EMTF do next?** Explore this opportunity with insurance companies and with relevant government bodies (e.g. Environment Agency) including scoping of work required to take this forward.

**Rank 12: ENVIRONMENTAL BONDS (Opportunity T6.2 – Financial & Legal Markets)**

**What is it?** A number of asset classes such as biodiversity, water, carbon, which are co-located on the same area of land, could be 'stacked' and an environmental bond created, providing a stable investment return, underpinned by e.g. government. Financing by government could leverage scaled-up investment which would help fund green growth

and jobs.

**Why we like it?** Responds to current upsurge of interest in environmental finance to sustain natural assets to reduce risks of future resource constraints and environmental disasters. Could deliver significant resources for restoration and enhancement of wide range of ecosystems. Expertise could be exported.

**What might EMTF do next?** Research on how to structure a bond using a) government finance incentives, b) taxation benefits, c) stacking different asset classes.

### **4.3 ENGAGING BUSINESS AND OTHERS**

167. In taking forward various business opportunities, a key challenge facing EMTF is engagement of the wider business community. We suggest that EMTF should build on the business sector consultation initiated by this study and by parallel EMTF initiatives (notably the call for evidence) in the next phase of its work. Our Study built a mailing list of some 500 recipients, and the workshop engaged over 60 in lively debate. We suggest that any follow-on work by EMTF should involve further workshops with key business interests in relation to some of the more promising business ideas. For example, it might be productive to convene representatives from the insurance industry to review the potential for their sector becoming involved with different PES schemes so as to mitigate flood risk, for example through helping protect or enhance peatlands and coastal marshes. It might similarly be helpful to, for example, convene woodland owners and the suppliers and installers of wood-burning stoves, so as to establish whether there might be a joint programme for them to pursue.
168. EMTF should also consider ways in which it might strengthen engagement with other stakeholders, particularly the conservation and environment NGOs, before final recommendations are made to ministers in 2013. Some NGOs have mixed views on the benefits, potential and implications for market-based instruments in the conservation and enhancement of ecosystems. It would be helpful to engage some of them during the course of crafting recommendations so as to as far as possible accommodate their views, and in the process making the final EMTF recommendations all the more robust.

### **4.4 SOME MACRO-ECONOMIC OBSERVATIONS**

169. We close this report with a few macro-economic observations. This study has identified a series of specific potential opportunities for ecosystem markets to develop in the UK. Many involve micro-scale interventions, including actions by Government (e.g. alterations to regulations) as part of the enabling actions required. However, as well as micro-scale actions, macro-scale policy decisions can have significant influence over the use of resources. For example, the landfill tax escalator introduced during the 1990s and accelerated in the 2000s has been linked to improvements in recycling rates, waste management practices and, possibly, a positive impact on the sector's reputation.
170. There are many macro-scale policy drivers that influence the use of ecosystems and their markets in economic activity, including taxes such as on fuel, landfill and aggregates, and regulations. Regulations can establish compliance markets (e.g. for Carbon in the EU

Emissions Trading System), and influence the way ecosystems are classified as assets. Investments in ecosystems and their management could be classified as either operating or capital costs, with capital investment having potential to produce returns over quite fast time periods in certain circumstances (e.g. flood risk reduction and water management more generally).

171. While the micro-level actions suggested can trigger and/or speed-up the development of new and/or existing markets, the long term prospects for ecosystem markets are heavily dependent on macro-scale policy decisions. The general idea of environmental tax reform applies specifically to the development of environmental markets: shifting the burden of taxation from employment to unsustainable resource use can improve the commercial returns on investments in ecosystem markets relative to other economic opportunities.
172. It could be argued that even such macro-economic changes would only go some way towards changing the market signals required to maintain and enhance ecosystems and their services, and that there is a need for a more fundamental systems change in the way that our economy and society accounts for, manages and uses natural capital. Current government initiatives such as the Natural Capital Committee, natural capital asset check and efforts to fully incorporate natural capital in the UK Environmental Accounts are important steps towards better accounting for the value of ecosystems in decision making processes. Following the publication of the UK National Ecosystem Assessment and the Environment White Paper, ecosystem services in the UK are now a relevant factor in planning decisions (see National Policy Planning Framework (2012)). While many of the market opportunities identified in this report arise from incremental changes that encourage markets to take better account of the value of nature, more fundamental changes in the way that we take account of the value of ecosystems in planning, economic development and wider decision making could have more profound impacts on the working of markets and the role of business.
173. Research and dialogue across the public, private and third sectors within the Living With Environmental Change partnership is suggesting that in a number of areas (e.g. water, agriculture, managing and insuring against extreme weather) ecosystem services is a key concept in helping develop new products and services that will be: safe for consumers and employees; secure in terms of the quantity and quality of supplies and the supply chain (including customers in this); resilient to environmental and demographic change; and sustainable in terms of resource use efficiency and environmental and social factors. It seems possible that by incorporating the ecosystem service concept and implementing it in a product or service system the likelihood of developing economically and socially successful local, national and global businesses will be enhanced because the environment will shift from being an awkward end of process consideration that may inhibit growth to one that fuels innovation and stimulates growth. There is plenty of evidence (over decades) from the chemical industry that resource efficiency and pollution control produces savings and forces the pace of innovation. In water, the food sector is making strides of this kind which are having unexpected positive benefits, such as improved working conditions, and the water utilities are reducing their carbon footprint. Other sectors now have the opportunity to implement ecosystem services into their business models. Likewise, government needs to continue to signal its commitment to the ecosystems approach, perhaps by encouraging the development and evolution of markets

for resources (such as water and nutrients such as nitrogen) akin to but more sophisticated than that for carbon. These markets might even consider valuing resources such as water in ways determined by supply and quality issues provided that basic supply needs were met for all sectors of society in terms of human well-being. A positive development for the management of water resources has been the Water White paper published in December 2011 which provides government commitments for reforming the water abstraction regime over the longer term. Taking into account the need to adapt to climate change, this reform aims at giving abstractors clear signals on water availability to allow them to plan effectively and invest for the future. In order for the reform to be delivered, the government will work closely with abstractors and other stakeholders<sup>19</sup>.

174. The scope for developing markets in these areas is considerable. The World Economic Forum risk reports for 2011 and 2012 show where some of the opportunities lie if the view is taken that if there is a risk there must be opportunities. In these reports, ecosystem service areas such as water, biodiversity, food, climate mitigation and impacts adaptation, together with issues such as the governance of these systems, receive an overall valuation of the same order as the current financial crisis itself.

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<sup>19</sup> <http://www.official-documents.gov.uk/document/cm82/8230/8230.pdf>

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# **ANNEX 1 – CATALOGUE OF IDEAS FOR SPECIFIC BUSINESS OPPORTUNITIES**



## **ANNEX 1A – IDEAS GENERATED BY THE STUDY TEAM**



# 1 PRODUCT MARKETS

## 1.1 *Expanding the reach and value of sustainability certification*

<b>Type:</b> 1 Product markets
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<b>No:</b> T1.1
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### 1. Please briefly describe the business opportunity

The opportunity is to sustain and grow the market for sustainably produced products, and to expand the cover of sustainability assurance to sectors or segments currently not covered. Businesses dependent on farm, forest, fish and wild products will have secure access to supplies, intermediaries and traders will be able to meet the demand of their clients and brands committed to sourcing sustainably produced products, and retailers will earn consumer loyalty and maintain and grow their market share. Producers will save costs in compliance with regulations, maintain the production potential of their lands and waters to continuously supply the market, and earn price premiums on their products. Under the right regime of sustainability standards and assurance or certification systems the companies can earn biodiversity and carbon credits that may eventually be traded or used to mitigate their own carbon and biodiversity foot prints. In addition, there would be opportunities for business in skills development such as for setting standards and auditing in sustainability, and through participation in the knowledge market around the growing discipline of sustainability assurance.

### 2. What business sectors and/or types of business would this opportunity benefit?

All economic sectors but mainly those that depend on or impacting natural resources directly, such as agriculture, forestry, fishing, mining, pharmaceuticals, bio-energy and tourism. Also sector related to nature through production process and supply chains, such as food manufacture, forest products, trade and retail.

### 3. What is the potential size of the market for this business opportunity?

Ethical production and its assurance that certification systems embody are growing in demand. Ethical spending in the UK grew from under £ 15 billion in 1999 to more than £ 45 billion in 2010. Globally too both the supply and demand for certified products grew. For example, against 20 million hectares of forest certified in 1999, more than 300 million hectares were certified by 2010 under FSC and PEFC alone. Against the base line of 125,000 metric tons in 2005, coffee sourced under four major voluntary schemes nearly tripled by 2009. Each of the certification schemes grew in the range of 19-64% annually. Yet, 82% of the world forests and 85% of the world coffee production remained to be certified. These trends are indicative of the potential for further certified production.

### 4. How would this business opportunity benefit ecosystems?

The potential is highly significant in all areas of influencing drivers of change, maintaining ecosystems' resilience, and enhancing the provision of corresponding services and goods particularly from agriculture, forest and aquatic ecosystems. How far this potential can be realized will largely depend on how this opportunity is

captured. If it is pursued as a narrow verification activity to tick the box, it will have a limited value of any eco-label. On the other hand if it is implemented as a robust mechanism to mitigate risks in the supply chains it will be much more useful. Its full potential however will come from understanding and implementing certification as a strategic option that uniquely bundles sustainability to optimize land use backed by credible verification mechanisms.

**5. What actions (policy, regulatory, incentives, etc.) might be needed to make this opportunity work in practice?**

Enabling policies such as public sector sourcing policies and requiring integration of sustainability in production standards alongside health, safety and quality will be critical for the realization of this opportunity as will be value chain finance. There would be a need for some new production insurance products to address any fluctuations in the market caused by global economic and political trends. Investment in research and development would be required to continually build and redefine the value proposition of certification. Likewise academic and vocational trainings such as in developing and implementing certification systems, sustainability assessments and other related skills may also need to be provided.

**6. What further EMTF research might help enable this opportunity?**

Perhaps the most important opportunity for research and development rests in redefining sustainable production standards. All current standards are premised on the current land-use being the best land-use. For example, an FSC certification for a forest assumes that the land is best suited for forestry. Likewise an RSPO certification assumes that the land is best suited for producing pal oil which may or may not be so. It is likely that a land under palm oil plantation may produce more economic and ecosystems benefits under an alternative land-use or combination of land-uses.

Since the demand on land for the multitude of benefits ranging from food security to bio-fuels, carbon sequestration, biodiversity diversity conservation and ecosystems integrity are growing, it will be increasingly important for the production and related certification and assurance systems to explicitly take into account potential alternate land uses to optimize the benefits for economy and ecosystems through multifunction production systems. The NEA clearly indicates the potential for such an optimization of land-use in the UK. Therefore, a new standards system that takes into account the land-use potential could be fundamentally game changing.

Additionally, the business case for the UK needs to be more clearly made in terms of the current and potential ES services best amenable to certification and their corresponding market size. It remains to be clarified what commodity sectors or parts of them are adequately covered for sustainability assurance systems, where these can be strengthened, and to which sectors these may be further extended.

## 1.2 Global centre of excellence for ecosystem services certification

**Type:** 1 Product Markets, also 2 offsetting, 3 PES, 5 markets for cultural services, 7 ecosystems knowledge economy, 8 corporate ecosystems initiatives

**No:** T1.2

### 1. Please briefly describe the business opportunity

The opportunity is to sell professional services to foster best practices in certification of products with associated ecosystem services benefits. These professional services would add value to the certification process. The centre would appeal to existing certification bodies in demonstrating their good practice, to companies and governments internationally wishing to develop market opportunities in this area, and to altruistic funders wishing to see greater uptake of certified products. There is also an opportunity to create intellectual property of economic benefit over the long term. Further it has the potential to attract investment, generate and expand employment in UK based certification bodies, and draw new certification bodies to the UK as the country builds its reputation as the hub of sustainability assurance. There is an also an opportunity here to further strengthen the leadership position of UK and its businesses in the sustainability movement globally with prospects to export UK knowledge and expertise.

### 2. What business sectors and/or types of business would this opportunity benefit?

Key sectors are those in the resource extraction and production process, supply chains, trade and retail. Currently sustainability certification is most followed in agriculture, forestry, fishing, tourism and climate change but going forward it would also be relevant to other sectors.

### 3. What is the potential size of the market for this business opportunity?

The market potential is twofold. First, certification as an assurance mechanism is a market imperative for sustainably produced products and services; certification is the best of the available tools to communicate the complex notion of sustainability to buyers. Second, scaling up and across the certification movement requires intellectual capital and skilled human resources that the UK could be building and supplying to ecosystems markets domestically and globally. The market for certified products is growing. Ethical spending in the UK grew from under £ 15 billion in 1999 to more than £ 45 billion in 2010. There was a parallel supporting change in people's behaviour towards greater ethical purchase decisions. Re-use and recycling increased. More people asked cared about a company's ethical credentials. Globally too, both the supply and demand for certified products have been growing. All major international voluntary certification systems have recorded significant growth. Yet, the full potential remains untapped. For example, 82% of the world forests and 85% of the world coffee production remained to be certified. This alludes to potentially large and growing market for certification and related knowledge and expertise. The likely speed of growth however can't be forecasted adequately.

### 4. How would this business opportunity benefit ecosystems?

The main benefit of certification is that it distinguishes a production process that is less

damaging to ES. It is almost impossible for any ecosystem services to be provided sustainably to the satisfaction of buyers without some assurance as to their impact of the production and supply processes on environment and people. This can be done in different ways for different products and services. Certification is the most tested and widely applicable mechanism. Sustainability standards and certification are found on concerns for ecosystems and dependent livelihoods. Increasing the application and effectiveness of certification systems directly contributes to the wellbeing of the ecosystems (forest, agriculture, fresh water, marine and others) they are designed to serve. Considering more than 80% of the world commodity production remains to be assessed for any kind of sustainability represents a huge potential for ecosystems protection and improvement.

**5. What actions (policy, regulatory, incentives, etc.) might be needed to make this opportunity work in practice?**

Certification seems to work effectively in the commodity market where sustainably produced certified products can be tracked and distinguished from those not certified via chain of custody assurance. By contrast sustainably certification has only begun to be tested for services such as watershed protection, and water flow and quality in rivers and aquifers that can't be easily commoditised. The knowledge and tools of certification will need to be sharpened to better capture the value of such ecosystem services. An effective public-private partnership will be required to realize the goal of establishing global centre of excellence in sustainability assurance as well as to create and manage a skilled cadre of professionals that can back the expansion of sustainability assurance at home and abroad.

**6. What further EMTF research might help enable this opportunity?**

Create the needed public-private partnership for realizing the global centre of excellence for sustainability; define business case more clearly and identify ES whose sustainable management can be enhanced by a corresponding effective assurance/certification system; measure existing size of domestic and global market as well as the investment and supply potential of UK activity; and, define what makes ES suitable for certification and identify scale of ES that meet these criteria but not currently in certified markets.

### 1.3 Enhanced productivity of fish stocks

Type: 1 Product markets

No: T1.3

**1. Please briefly describe the business opportunity**

There could be opportunities for investors to seek returns through supporting the recovery of fish stocks. By investing in changed fishing practices, stocks could recover to the point where increased catches provide revenue to repay investors with dividends. WWF has looked at this type of mechanism as one way to aid the recovery of the Grand Banks cod fishery in Newfoundland. There could be several ways of structuring such an idea so that it could create the right kinds of incentives for investors. For example a share of the value of the market value of the fish caught, or an actual share of the fish to sell through a retail chain.

**2. What business sectors and/or types of business would this opportunity benefit?**

Companies seeking secure supplies of fish to ensure business continuity would benefit from this kind of opportunity. Supermarket chains would be one such industry. It might also be of interest to financial organisations simply searching for good investments with favourable rates of return.

**3. What is the potential size of the market for this business opportunity?**

Potentially very considerable, considering the rising demand for fish.

**4. How would this business opportunity benefit ecosystems?**

Investments in changed fishing practices that result in higher fish catches would have to be based on the wider beneficial management of marine systems. For example, investors would pay fishers to stay in port for a period of time until fish populations recover. When fishing resumes it would be at levels aimed at securing an optimal yield in line with ecosystem productivity. Ecosystems in good health would generally be the ones producing more fish.

**5. What actions (policy, regulatory, incentives, etc.) might be needed to make this opportunity work in practice?**

Each situation is different but regulatory action would be needed to ensure that different kinds of 'tragedies of the commons' did not result, for example as a result of the benefit of some fishers staying in port being undermined by others who continue to fish, thereby preventing proper recovery of stocks. This would basically come down to a clear allocation of access or property rights so that fishers could attract investment to increase the value of their asset. These property rights could take a number of forms, including quotas that can be traded, as has been used in Iceland. Other official action could be taken in relation to the allocation of subsidies, to for example end the further increase in fishing capacity, arising for example from financial aid to build new boats".

**6. What further EMTF research might help enable this opportunity?**

Consultation among fishing communities would be important to assess what level of interest exists for this kind of idea in the UK, and to understand what kinds of

regulatory action might enable it to progress.

## 1.4 Woodland enhancement through a larger market for wood fuel

**Type:** 1 Product markets, 4 Environmental technologies

**No:** T1.4

### 1. Please briefly describe the business opportunity

Domestic wood burning heaters are becoming more popular. Woodlands local to growing markets (villages and towns) could be managed so as to optimise wood fuel production while meeting nature conservation benefits.

### 2. What business sectors and/or types of business would this opportunity benefit?

Wood fuel and wood burner markets are growing and could grow much further.

### 3. What is the potential size of the market for this business opportunity?

Potentially huge, embracing millions of homes.

### 4. How would this business opportunity benefit ecosystems?

The under-management of many native woodlands is often linked to declining conservation values. By incentivising and encouraging a larger market for wood fuel from well-managed woodlands it would be possible to increase biodiversity benefits.

### 5. What actions (policy, regulatory, incentives, etc.) might be needed to make this opportunity work in practice?

Helping to put woodland owners in contact with the market would be a helpful step that could be taken by government, along with the establishment of best practice standards in terms of maximising nature conservation benefits. Some additional measure to the Renewable Heat Incentive could be put in place to encourage this particular means of generating renewable heat.

### 6. What further EMTF research might help enable this opportunity?

A survey of woodland owners and some sense of the market opportunity as seen by the manufacturers and installers of wood burners would be helpful. These groups could help to determine what kind of market-building actions could be taken by government, or indeed NGOs.

## 1.5 *Designing packaging as fuel*

**Type:** 1 Product markets, 4 Environmental technologies

**No:** T1.5

### 1. Please briefly describe the business opportunity

This opportunity would address two environmental challenges: management of the significant volumes of packaging waste generated by consumers and business, and the need to move alternative (non-fossil-fuel) sources of energy generation. Vegetation-based materials (card, cellulose) are often used in packaging and these can have calorific content. The suitability of packaging materials as a fuel for energy generation could be specifically defined, and marked on packaging so they can be separate in the waste stream, allowing their use as fuel. This could apply to packaging made from virgin resources or from recycled materials, and the resulting environmental benefits gains will depend on where in different resource flows it is utilised.

### 2. What business sectors and/or types of business would this opportunity benefit?

Could involve a wide range of businesses because packaging is relevant to most sectors, but waste/materials and energy sectors are key.

### 3. What is the potential size of the market for this business opportunity?

The market could be substantial when the large demand for packaging and energy are considered, but the market where this option is the best use of resources may be smaller, with potential is constrained, by technical, design, behavioural and other barriers.

### 4. How would this business opportunity benefit ecosystems?

It will reduce carbon emissions and consumption of virgin materials for packaging, with combined woodland management, energy and waste impacts.

### 5. What actions (policy, regulatory, incentives, etc.) might be needed to make this opportunity work in practice?

Technological feasibility studies on sources of materials, packaging design, combustion standards and energy recovery, plus regulatory and logistical considerations for coordination of standards and processes between packaging, waste and energy sectors.

### 6. What further EMTF research might help enable this opportunity?

Inputs to this idea from materials experts. Exploration of symbiosis pilot linking a small number of businesses using large volumes of packaging to incinerators for energy generation. Potential availability of materials, packaging technologies, waste collection practices and energy generation potential and options.

## 2 OFFSETTING

### 2.1 Biodiversity offsets, including through conservation banking

Type: 2 Offsetting

No: T2.1

#### 1. Please briefly describe the business opportunity

The opportunity is to stimulate the creation of a range of new companies and new business models for existing companies (or non-profit organisations) to provide biodiversity offsets in the UK. A set of new, small and medium-sized enterprises (including individual farmers) would evolve to meet a clear demand for offsets in the UK. This new market would create business opportunities for a range of supporting service providers, including: environmental consultants (to advise developers on application of the mitigation hierarchy to minimise their offset needs and to design offsets); brokers to match developers needing offsets with conservation banking companies and other potential suppliers of offsets; registry/ies to record offsets to provide legal certainty and ensure that 'credits' are not sold twice to different developers; certifiers to monitor delivery of offsets either through bespoke arrangements or through conservation banks; and financial services ranging from loans to start conservation banks to insurance products.

#### 2. What business sectors and/or types of business would this opportunity benefit?

Mining & Quarrying, Energy, Construction, Transport, Agriculture, and Forestry, Fishing, Water and Waste Water, Tourism & Recreation, Financial Services, Public Administration, Education. These might benefit through one or more of the following: (i) greater clarity, certainty, reduced development delays; (ii) better net developable areas as a result of purchasing offset credits; (iii) provision of receptor sites to receive funds generated by offsetting; (iv) providing advisory services; (v) increased green space for e.g. recreation or education.

#### 3. What is the potential size of the market for this business opportunity?

Current estimates include that for housing development alone (on the basis of 300,000 houses being required annually), a conservation banking market would generate GBP 50-300 million per annum in credits. (Source: pers.comm. Tom Tew, The Environment Bank.) (Annual markets for biodiversity offsets aggregated globally are now in the order of US\$3bn. Source: Ecosystem Marketplace.)

In terms of developer uptake of offsetting, it is important to note that offsetting can deliver substantial costs savings to developers. First, offsetting will lead to greater clarity and certainty in the planning system. This enables developers to secure easier funding terms and to budget costs more accurately (saving time, hence money). Second, offsetting would lead to more predictable costs and outcomes to aid project planning. Third, offsetting can obviate the burden on the developer for long-term mitigation delivery, reducing financial liabilities (many developments currently require long-term funding to manage habitats on-site, which they find a significant encumbrance and liability). Fourth, offsetting leads to increased net developable areas

and hence better financial returns on the land investment. Finally, mandatory offsetting and early planning of offset purchase costs would enable developers to absorb offset costs through deductions on residual land values – in this case, the developer reaps the above benefits, without any additional net costs.

**4. How would this business opportunity benefit ecosystems?**

The potential for marine, aquatic and terrestrial ecosystems is considerable, since offsets are based on delivering ‘no net loss’ on a ‘like for like or better’ basis. This goes beyond current UK requirements and practice, and would result in developers taking responsibility for rectifying their footprints and contributing additional funding to deliver measurable conservation outcomes. The ecosystems that would benefit are those which are suffering impacts from development projects. Ecosystem gain would include significant contributions to conservation investments in the UK, greater connectivity, avoided fragmentation, and landscape level planning to avoid impacts on high conservation value areas and to devote offset investments to these areas.

**5. What actions (policy, regulatory, incentives, etc.) might be needed to make this opportunity work in practice?**

The principal enabling action that is required is regulation or unambiguous policy interpretation by government that clarifies that biodiversity offsets are necessary in defined circumstances, and that establishes a framework for implementation to a particular standard, including through conservation banks.

**6. What further EMTF research might help enable this opportunity?**

Further specific work by EMTF might focus on developing and articulating the business case for mandatory offsets (vs voluntary offsets), and developing an appropriate legal framework for delivery of mandatory offsets. It is likely that some form of Section 106 planning obligation would be most appropriate. Suitable wording needs to be crafted and then an opinion sought from a planning QC, so that it provides a robust mechanism. The EMTF could commission work to draft this robust mechanism that would then be available for use by planning authorities, giving a clear and consistent delivery mechanism for deploying biodiversity offsetting. Without a legal framework and wording, the approach will lead to inconsistencies, lack of deployment and confusion. This would represent significant added value to speed up delivery of offsetting nationally.

Further research (probably beyond EMTF resources) might include: developing the basis for defining biodiversity credits; and definition of standards for conservation banks and individuals/organisations supplying offsets.

## 2.2 Soil carbon enhancement via changed grazing practices

**Type:** 2 Offsets, also 1 Product markets, 3 PES

**No:** T2.2

### 1. Please briefly describe the business opportunity

Research in different parts of the world (for example southern Africa and Australia) has revealed how levels of soil carbon can be significantly increased through changes to grazing practices. Co-benefits in the form of soil water retention and mitigation of flood events demonstrate how such strategies might also be adopted for reasons of climate change adaptation. Nature conservation benefits can be pursued at the same time, for example through the development of more diverse pasture flora. Businesses with large carbon footprints, some of which is linked with the dairy or livestock sectors, could make significant emissions reductions via changed grazing practices, as well as the use of clean energy and energy efficiency in their processes and supply chains. This could be assisted through the development of new guidance and metrics relating to the increase of soil carbon in pasture.

### 2. What business sectors and/or types of business would this opportunity benefit?

This opportunity presents potential benefits to those sectors with dairy and other livestock products in their supply chains, for example major retailers looking to achieve ambitious climate change mitigation strategies. Farming businesses can also foresee benefits in the form of access to carbon-conscious markets and through ensuring the long-term productivity of their land.

### 3. What is the potential size of the market for this business opportunity?

A high proportion of the UK's farmland is given over to pasture of different kinds. Carbon abatement strategies linked to land use in the UK have been a relatively neglected aspect of climate mitigation and as such offer new opportunities for leadership in demonstrating how a temperate country can enhance the carbon capture properties of intensively used ecosystems.

### 4. How would this business opportunity benefit ecosystems?

Higher levels of soil organic matter would render soils more resilient to drought and help to prevent erosion. Nature conservation benefits in the form of more diverse pasture vegetation would be possible to achieve at the same time.

### 5. What actions (policy, regulatory, incentives, etc.) might be needed to make this opportunity work in practice?

Some form of official guidance on how best to enhance soil carbon beneath pasture might at least facilitate some form of voluntary action, even if not generating officially-recognised carbon credits that could be traded in a recognised carbon market.

### 6. What further EMTF research might help enable this opportunity?

A review of research already undertaken in different parts of the world would at least help to determine a research agenda pertinent to the UK and other most temperate regions. Alongside steps to determine how grazing regimes might maximise soil carbon capture, it would be helpful to convene a workshop of leading companies with a heavy

reliance on dairy and livestock products that also have stretching carbon reduction targets. This could include companies such as Nestle and Tesco.

## 2.3 Peatland carbon code

Type: 3 PES

No: T2.3

### 1. Please briefly describe the business opportunity

There is an opportunity to develop a peatland carbon code, similar to the woodland carbon code developed by the Forestry Commission, which provides the framework for companies to purchase carbon credits to support the **restoration of degraded peatlands**. This opportunity recognises the increasingly degraded nature of peatlands and the negative impacts this has on a range of ecosystem services, such as carbon, biodiversity, water quality and amenity. To reverse this trend the peatland carbon code would provide a transparent and verifiable approach to re-habilitating peatlands based on sound science. Carbon savings associated with these measures could then either be sold on the voluntary carbon market or, assuming the UK government recognised peatland in its greenhouse gas (GHG) accounting procedures, presented in company reports as part of their CSR initiatives.

The creation of a peatland carbon code would complement the woodland carbon code and would generate capital to support the restoration of peatlands. This would have a positive impact on a range of ecosystem services including carbon sequestration, biodiversity, water quality and recreation.

The creation of a peatland carbon code is the logical next step to activate a national carbon market. The UK could develop a leadership position in the development of national and regional carbon markets and export that expertise to other interested countries.

### 2. What business sectors and/or types of business would this opportunity benefit?

The peatland carbon code would be of particular relevance to the tourism & recreation sector, the water and wastewater sector, the agriculture and forestry sector. The wind energy sector would be potentially interested as well.

### 3. What is the potential size of the market for this business opportunity?

The peatland carbon code would lead to the extension of the existing voluntary carbon market to include a low cost, low risk application. The market potential for the peatland carbon code is significant. Market research suggests demand from UK companies and individuals wishing to voluntarily support land-based carbon reduction projects is likely to exceed 1million tons of carbon reduction per year (and could potentially exceed 10 million tonnes). Demand is likely to come from both individuals (e.g. offsetting flights, a service that is increasingly offered to customers by the travel industry) and corporations.

The woodland carbon code, which is the most similar mechanism currently set up in the UK, has secured the sequestration of 1 million tonnes of CO<sub>2</sub> from the atmosphere through registered projects, covering 2733 hectares. This demonstrates that providing the right framework can be put in place, the market potential is significant.

**4. How would this business opportunity benefit ecosystems?**

Creating a peatland carbon code could be significant in restoring degraded peatlands and enhancing the wide range of ecosystem services they provide, which include carbon storage and sequestration, erosion and wildfire control, water regulation (water quality regulation and to some extent run-off retention), cultural services, such as recreation, landscape aesthetics and conservation of the paleo-environmental archive, as well as the provision of habitat for wildlife in one of the largest remaining semi-natural ecosystems in the UK.

**5. What actions (policy, regulatory, incentives, etc.) might be needed to make this opportunity work in practice?**

There is a range of enabling conditions that would facilitate the delivery of a peatland carbon code. These relate to the need to market the mechanism to businesses and to continue improving the science and carbon accounting methodology that underpins the code. While not a pre-requisite to establishing the code, the inclusion of peatland re-wetting and restoration in the UK governments GHG accounting procedures, would encourage greater uptake among businesses.

**6. What further EMTF research might help enable this opportunity?**

This includes: undertaking research into the attitudes of businesses to the code and their willingness to contribute; setting up meetings with senior CEOs of banks, retailers etc. to hear about the importance of peatlands and to create momentum behind the idea; awareness raising with governmental (regional and national) authorities on their potential role as registries.

### 3 PAYMENT FOR ECOSYSTEM SERVICES

#### 3.1 Carbon sequestration PES as an 'allowable solution'

**Type:** 3 PES, 2 Offsetting

**No:** T3.1

**1. Please briefly describe the business opportunity**

The opportunity is to stimulate an increase in the funding available for carbon abatement and sequestration through improvements to the natural environment. It is an opportunity for private developers to contribute to carbon sequestration through purchasing Allowable Solutions Certificates generated through measures such as woodland creation or peatland rehabilitation, which would also provide a range of co-benefits, including for recreation and biodiversity. The opportunity is clearly of most relevance to the construction sector but also to landowners / managers willing to give over / manage land for carbon sequestration / storage. Allowable Solutions measures will be needed to meet the zero carbon Building Regulations in 2016 but the proposed widening of these to encompass natural environment solutions would arguably lead to a further 'greening' of the market. This would support a range of 'knowledge providers' who would be required to provide the technical evidence for the monitoring, reporting and verification framework.

**2. What business sectors and/or types of business would this opportunity benefit?**

The construction, agriculture and forestry sector. The construction sector provides the capital to fund carbon sequestration projects, which are then carried out largely on agricultural and forestry land.

**3. What is the potential size of the market for this business opportunity?**

The Zero Carbon Hub argues that "The right framework for Allowable Solutions could stimulate innovation and create huge opportunities for leveraging secondary funding from businesses, debt financiers and private investors that are looking to invest in carbon-reduction projects"<sup>20</sup>; obviously this depends on natural environment solutions such as woodland creation and peatland restoration being included as 'Allowable Solutions'.

**4. How would this business opportunity benefit ecosystems?**

Including carbon sequestration projects centred on the natural environment as Allowable Solutions could be potentially significant in terms of increasing woodland creation and promoting peatland rehabilitation and the ecosystem services they provide (particularly in terms of biodiversity, landscape, water and recreational co-benefits).

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<sup>20</sup> Zero Carbon Hub (2011). *Allowable Solutions for Tomorrow's New Homes: Towards a Workable Framework* [online] available at: [www.zerocarbonhub.org/resourcefiles/Allowable\\_Solutions\\_for\\_Tomorrows\\_New\\_Homes\\_2011.pdf](http://www.zerocarbonhub.org/resourcefiles/Allowable_Solutions_for_Tomorrows_New_Homes_2011.pdf) (accessed 1 April 2012).

**5. What actions (policy, regulatory, incentives, etc.) might be needed to make this opportunity work in practice?**

The principle enabling action that is required is for carbon sequestration projects centred on the natural environment to be included as 'Allowable Solutions' as part of the zero carbon building regulations. There will also be a need to ensure the carbon sequestration benefits from woodland creation and peatland rehabilitation etc. can be adequately quantified and verified for the purposes of issuing Allowable Solutions Certificates.

**6. What further EMTF research might help enable this opportunity?**

The possibility of including carbon sequestration projects centred on the natural environment as Allowable Solutions needs to be explored with Government departments (CLG, Defra, DECC) and bodies such as the Zero Carbon Hub and the Forestry Commission.

### 3.2 Layered PES

Type: 3 PES

No: T3.2

**1. Please briefly describe the business opportunity**

The opportunity relates to the potential of layered Payment for Ecosystem Services (PES) schemes to increase funding targeted at protecting and enhancing the natural environment. In layered PES schemes different ecosystem services, which arise from the same plot of land, are sold to different buyers. On a small scale this would involve community groups, local businesses, the local authority and other interested parties purchasing those ecosystem services which they were interested in from a local resource (e.g. a river). On a larger scale, it could involve reforming the existing grant system (Environmental Stewardship and the England Woodland Grant Scheme) to improve their effectiveness. Government financed PES are currently 'bundled' and there is an opportunity to 'un-bundle' and re-structure these schemes to align them with PES best practice, where payments are differentiated, spatially targeted, and conditional. The provision of grants could be made conditional on the provision of ecosystem services and different ecosystem services could be bought by different user groups. In this way private equity could be leveraged alongside public money to support the natural environment.

**2. What business sectors and/or types of business would this opportunity benefit?**

Layered PES schemes are relevant to all business sectors. The aspiration is to link different sources of revenue, from both private and public sectors, and to combine them to help better protect and enhance the natural environment.

**3. What is the potential size of the market for this business opportunity?**

This opportunity is at an early conceptual stage and therefore the potential is difficult to assess. However, the widespread application of layered PES schemes at both the small and large scale would significantly increase the revenue flowing to the protection and enhancement of a range of ecosystem services across a range of broad habitat types. It is likely that businesses would be interested in purchasing particular ecosystem services (e.g. water quality or flood risk protection), which they could directly benefit from without the need to pay for services which they did not directly benefit from (e.g. biodiversity).

**4. How would this business opportunity benefit ecosystems?**

Due to the fact that this opportunity remains largely conceptual the significance is difficult to assess. However, layered PES schemes can be set up to fund the full suite of ecosystems and the services they provide. Layered PES schemes increase the likelihood that beneficial initiatives will be undertaken and therefore the opportunity could be significant.

**5. What actions (policy, regulatory, incentives, etc.) might be needed to make this opportunity work in practice?**

A whole range of enabling actions is required in order to develop the idea. In particular research into the legal and other barriers and opportunities of layered PES needs to be

undertaken; market research into the appetite for such systems should be undertaken and small scale pilot projects could be set up.

**6. What further EMTF research might help enable this opportunity?**

Research into the barriers and opportunities for such systems and consideration of the advantages and disadvantages of reforming the existing government-financed grant schemes.

### 3.3 *Baselining ecosystem services provision*

**Type:** 3 PES, also relevant to most other 'types'

**No:** T3.3

**1. Please briefly describe the business opportunity**

There are many potential market opportunities to sell ES, but each relies on some identification of additional (enhanced or avoided deterioration) provision of ecosystem services. This in turn requires a clear understanding of the current baseline of ES provision, against which such additional impacts can be assessed. Our knowledge of ES baselines is improving, but is still uncertain, and is often self-assessed by ES providers. This creates inconsistency and an incentive measurement bias. A business opportunity may exist to sell baseline ES information to providers and purchasers ES products, and also in how baselines are measured. It also can create barriers where expertise is needed (to measure baselines) that is not readily available to ES providers.

**2. What business sectors and/or types of business would this opportunity benefit?**

This would be part of the knowledge-based economy, information could be sold to a variety of providers and beneficiaries of ES.

**3. What is the potential size of the market for this business opportunity?**

The market for different ES products is large, and markets for baseline information could be a small part of a wide range of different sub-markets.

**4. How would this business opportunity benefit ecosystems?**

It will enable more accurate decision-making in relation to use of ecosystems and expected changes in ES.

**5. What actions (policy, regulatory, incentives, etc.) might be needed to make this opportunity work in practice?**

That various best-practice/guidance (e.g. carbon codes) recognise the need for clear accurate baseline information.

**6. What further EMTF research might help enable this opportunity?**

Sector testing (e.g. peatland carbon code) of combination of existing information sources using transparent methods and best-available data (e.g. from NEA, satellite imagery and modelling such as that by Fezzi et al. reflected in NEA).

### 3.4 Ecosystems restoration

Type: 3 PES, 2 Offsetting

No: T3.4

**1. Please briefly describe the business opportunity**

The opportunity is to restore degraded forest, heath lands and aquatic ecosystems. This will be through enrichment of degraded ecosystems, restoration of converted lands to their previous uses, and creation of all together new habitats, *inter alia*, through creative waste management. A particular opportunity is to restore aquatic ecosystems where fish stocks have declined. Another interesting opportunity is to rehabilitate degraded farms, heaths and peats for their production, carbon sequestration and tourism potential. Opportunities are also there to find mutually beneficial linkages between infrastructure projects and ecosystem restoration as exemplified by the proposed London Crossrail project and restoring abandoned mine sites as done by the Eden project. To map and quantify ecosystem degradation and associated restoration needs across the UK by itself would be an interesting business opportunity. Spread across the UK and spanning all ecosystems types, restoration offers opportunities to forge public private partnerships, to save costs associated with compliance as in the mining construction and waste disposal sectors, and to generating new revenue streams as in case of Eden Project.

**2. What business sectors and/or types of business would this opportunity benefit?**

Most restoration needs and opportunities would appear are farming, forestry, fisheries and mining and waste management sectors.

**3. What is the potential size of the market for this business opportunity?**

The market potential is significant but the size of the total market is not known. Business opportunities in restoration are amenable to high and low investments and can generate both short and long term benefits. They are scalable considering the presumably large number of degraded land and seascapes. By its nature, restoration resembles a construction project that would employ people in restoration effort. Depending on the restoration effort, there would be opportunities both for big and small businesses

**4. How would this business opportunity benefit ecosystems?**

The opportunity will address several drivers and trends of ecosystem change but its main benefits will accrue from restoring and possibly expanding ecosystems and from the services and goods that they will provide. Given their relatively large size and corresponding restoration needs, the opportunity likely to be more significant for heath lands, fresh water and marine ecosystems. The potential for creating new habitats (wetlands and islands) through creative waste management could also be significant.

**5. What actions (policy, regulatory, incentives, etc.) might be needed to make this opportunity work in practice?**

Most pressing is the requirement for a reliable and up to date information base. Also required will be enabling policies that incentivize restoration and leverage the market

interest and investment for the purpose.

**6. What further EMTF research might help enable this opportunity?**

Scoping out and mapping out the ecosystems restoration needs and opportunities across the Kingdom for the government to make informed policy choices and for business to confidently partake in implementing those policies.

## 4 ENVIRONMENTAL TECHNOLOGIES

### 4.1 Water reuse technologies

**Type:** 4 Environmental technologies, 1 Product markets

**No:** T4.1

#### 1. Please briefly describe the business opportunity

Water reuse is a sustainable practice that can be financially profitable. Recycled water can satisfy most water demands, as long as it is adequately treated to ensure water quality appropriate for the intended further use. Common industrial practice typically consists of end-of-pipe solutions that will allow the effluent to meet certain discharge standards before being released into the environment, and the separate sourcing of clean water for their operations. Such linear modes of production are unsustainable and are becoming costly. By reusing water a number of benefits can be achieved: contribution to alleviating water scarcity problems, pollution prevention through decreased effluent discharge, enhancement of the status of wetlands and other habitats, water conservation from the reduced need to extract and treat freshwater, reduced energy consumption from the otherwise separate treatment of freshwater and wastewater. Business benefits include income generation from water export to other end uses (e.g. agricultural and landscape irrigation, cooling water for power plants etc), enhanced self-sufficiency for water, reduction of wastewater discharge costs, elimination of business risks related to spatial and temporal water availability and possible future regulatory changes on wastewater discharge and management (that could entail additional costs), and increasing the brand value.

#### 2. What business sectors and/or types of business would this opportunity benefit?

Most relevant business sectors include: agriculture, manufacturing industries, the energy sector, water industry, construction, mining and quarrying, recreation, food and beverages etc.

#### 3. What is the potential size of the market for this business opportunity?

The market potential is significant, especially if some measures were to influence issues linked directly to global water security as the overseas component of the UK's "water footprint" may be as high as 65%. Current use of these technologies in the UK is limited, but the range and magnitude of potential applications is enormous. The UK may also be well placed for technology export potential. This opportunity is in line with the Water White Paper that was published in December 2011, which demonstrates its great relevance for the current and future UK context.

#### 4. How would this business opportunity benefit ecosystems?

This opportunity is very significant for both ecosystems and ES, as improved water availability and quality is of fundamental importance to all ecosystem functions and the delivery of many ecosystem services.

**5. What actions (policy, regulatory, incentives, etc.) might be needed to make this opportunity work in practice?**

The most important enabling actions are: policies, institutions and governance, changing social attitudes, knowledge generation and exchange (importantly making best use of existing knowledge and technologies), technologies and practices, markets and incentives, voluntary actions and education and leadership. While large companies with an international presence are more likely to engage in such opportunities as part of their long term planning and in the interest of creating a sustainable profile (as is currently the case), SMEs may be more reluctant to adopt this technology as they may not perceive the potential benefits. The collection and dissemination of information in order to make a business case for this opportunity is therefore very crucial. Developing a clear agenda of business needs across all sectors would help drive innovation and any necessary research.

**6. What further EMTF research might help enable this opportunity?**

Research is needed into the current UK context on water (shifting due to the need to cope with short term extremes long term trends towards scarcity driven by climatic factors and demographic issues) and how it can be improved in order to achieve the appropriate balance of regulatory, economic, technological and socio-political conditions. This research would help ensure business attitudes and decisions on water were fully conversant with supply chain opportunities and customers' social profiles, and might be targeted on opportunities for developing customer awareness of how to manage their water use and local, in-house and in-garden resources more sustainably.

Developing more clarity on how different businesses value and see their dependencies and vulnerabilities to water extremes and long term trends and changes to the regulatory regimes presaged in the Water and Natural Environment White Papers (e.g. changes to abstraction regimes) may point up business opportunities.

Decision making should be evidence based, and aligning the work of EMTF and the UK Water Research and Innovation Partnership (chaired by the Government Chief Scientific Adviser) is important and would help improve access to and influence over the research base and innovation opportunities (such as those provided through the Technology Strategy Board).

Scoping how to develop and share knowledge on how water is currently used in business will allow for the development of appropriate models of water use with outputs that can be used to inform decision-making.

Scoping studies developing on-site demonstrations of water efficiency will encourage customers to purchase scaled down (or scaled-up versions) of the technologies and products involved (e.g. to maintain gardens during dry periods and reduce time needed for maintenance).

## 4.2 Product redesign for generating secondary outputs

**Type:** 4 Environmental technologies, 1 Product markets

**No:** T4.2

### 1. Please briefly describe the business opportunity

The proposed business opportunity consists of redesign of production or the application of new technologies to generate secondary outputs of value instead of normally generated waste. For companies, optimising the use of resources is an axis of innovation, which can be integrated into the product development and process design stages. While current eco-design practices usually suggest the minimisation of waste, it might be more profitable and eco-friendly, under certain conditions, to redesign production so that other resources - 'valuable waste' (secondary outputs) is generated instead of waste. Important business benefits that this approach can deliver include: revenue generation from the sale of secondary outputs, savings on discharge costs, savings on the purchase of raw materials, minimisation of environmental compliance costs, minimisation of business risk (e.g. ensuring security of supply of critical materials), production expansion despite restrictions in the natural availability of certain resources etc. Environmental benefits arise from reduced need and associated impact of raw material extraction, transport and processing, and waste generation.

### 2. What business sectors and/or types of business would this opportunity benefit?

This opportunity is relevant to a very broad range of manufacturing activities (e.g. chemical industry, food manufacture, and pharmaceuticals), the energy sector, the waste management sector, the water industry, the construction sector, agriculture, mining and quarrying etc.

### 3. What is the potential size of the market for this business opportunity?

The market potential is significant, given the large number of relevant production activities (particularly manufacturing). The many types of materials involved and the large quantities in which they are generated, makes the possibilities for synergies potentially huge.

### 4. How would this business opportunity benefit ecosystems?

This opportunity is very significant for all ecosystems and ecosystem services (particularly for provisioning, supporting and regulating), as it overall enhances the environmental quality through the conservation of resources and pollution reduction.

### 5. What actions (policy, regulatory, incentives, etc.) might be needed to make this opportunity work in practice?

A combination of enabling actions is required: enabling legislation, policies and governance and a change in social attitudes. Knowledge, development of technologies and practices, market incentives and voluntary actions are also particularly important

### 6. What further EMTF research might help enable this opportunity?

Research is needed to critically evaluate development paths and identify opportunities where this approach can deliver significant benefits. Changes in legislation, business attitudes and consumer behaviours are required for these to realise.

## 5 MARKETS FOR CULTURAL SERVICES

### 5.1 *Optimizing the ecological and economic benefits of sustainable tourism*

<b>Type:</b> 5 Markets for cultural services, 1 Product markets, 2 Offsetting, 3 PES	<b>No:</b> T5.1
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#### 1. Please briefly describe the business opportunity

Tourism is a mature market in UK and opportunities in air travel, ground transportation, food and retail are obvious. These opportunities can be expanded but, unless carefully done, they may be hurt then help ecosystems. The new opportunities stemming from the NEA are to make green and blue spaces more accessible, enhance the quality and experience of recreation, and better distribute visitation from domestic and international tourism, and to invest part of the tourism income in the health and resilience of the host ecosystems. The opportunity also is to provide amenity housing, to restore ecological sites of tourism interest and to do so capitalizing on the other opportunities such as in waste disposal of construction and mining wastes. Other opportunities are to promote existing attractions and creating new sustainable tourism infrastructure, to better promote UK natural and cultural endowments internationally, and to assess and address travel footprints in UK. This can be financed in having travels offset their foot print through pricing, levies and pay back schemes. NEA alludes to mirroring fitness clubs in urban areas with 'green therapy centres' in rural UK as an interesting business opportunity. Medical tourism would be likewise interesting.

#### 2. What business sectors and/or types of business would this opportunity benefit?

This is essentially an opportunity in the tourism sector. However agriculture, forestry, fisheries, food, transport and retail that support or benefit from tourism are also relevant as are the housing and real estate sectors catering to the needs for tourism and amenity housing.

#### 3. What is the potential size of the market for this business opportunity?

The market for tourism is growing globally, and there is an obvious trends toward nature based sustainable tourism. NEA shows that foreign visitors spend £16 billion in UK. According to one estimate, in 2000, UK habitats received 3.2 billion visits estimated at over £ 10 billion. Another estimate puts English recreation alone at 2.858 billion visits with direct expenditure of £ 20.4 billion; UK wide values would exceed £ 30 billion. Despite the variations in numbers, the large size of the market and business opportunities are obvious. People are travelling more for leisure and other purposes (estimated at more than 40% of all travel). 74% UK people consider green space very important. But far few indulge in significant outdoor activity representing significant untapped market potential. Likewise, housing in the proximity of national parks and water bodies is pricier indicating the scarcity of supply for businesses to address.

**4. How would this business opportunity benefit ecosystems?**

It is important to contrast sustainable tourism from mass tourism. Sustainable tourism is largely premised on the non-consumptive use of nature recognizing that some activities such as water supply to facilities and sport hunting would be consumptive. Mostly, nature based tourism can only thrive in ecosystems that are intact or well-managed for visitors to appreciate nature in all its bounties. By extension, protecting ecosystems and enhancing their service potential would be of inherent interest to business and an integral part of its business plan.

**5. What actions (policy, regulatory, incentives, etc.) might be needed to make this opportunity work in practice?**

Public policy, regulatory and financing infrastructure for tourism is pretty well established in UK and not much would be needed here additionally. Recent green policies such as biodiversity offsets and others contribute to the enabling environment. However, some policy adaptation will be required to harness the newly identified opportunities and to better distribute the environmental costs and economic opportunities associated with sustainable tourism. These would include among others, PES / payback schemes to strengthen the link between those who benefit and those who manage ecosystems, thus encouraging investment in ecosystems, promotional schemes and international marketing efforts that use economies of scale to promote UK ecosystems to potential visitors.

**6. What further EMTF research might help enable this opportunity?**

There are two key uncertainties here. One relates to the valuation of ecosystem services in relation to nature based tourism. A lot of research has been done but estimates still vary and at times widely. A more accurate estimate will increase business confidence in underlying public policies.

Second, the feasibility of various opportunities needs to be more accurately established. Some ideas are very promising but costs and benefits associated with them need to be better measured. This can be achieved through a combination of pre-feasibility studies in the private sector and related supporting research and development in the public sector.

## 6 FINANCIAL AND LEGAL SERVICES

### 6.1 Reducing risk for insurers through investment in green infrastructure

**Type:** 6 Financial and legal services

**No:** T6.1

**1. Please briefly describe the business opportunity**

Recent years have seen large-scale losses to the insurance industry as a result of extreme weather, such as flooding. Extreme events are becoming more common, and could eventually create a systemic challenge to an industry that is based in large part on the assessment of risk based on past events. As new circumstances emerge in relation to the more frequent occurrence of extreme events, it might be that insurers could reduce their exposure through the enhancement of green infrastructure, such as woodlands, coastal wetlands or upland peat bogs.

**2. What business sectors and/or types of business would this opportunity benefit?**

Insurance directly, but potentially others would experience co-benefits, such as tourism.

**3. What is the potential size of the market for this business opportunity?**

Potentially considerable in those areas where a clear case can be made to show how the restoration or protection of nature can reduce the risks of damage to insured assets. There is already a call for future flood prevention to be based on the restoration of green infrastructure, for example in the wake of the Cocker mouth and Sheffield floods. Insurers could be brought in to assess their interest in investing in schemes that would cut their risks.

**4. How would this business opportunity benefit ecosystems?**

Nature conservation goals (for example in relation to the increase in native woodlands or restoration of degraded blanket bog) would be pursued as the means to achieve economic ones (reduced flood damage).

**5. What actions (policy, regulatory, incentives, etc.) might be needed to make this opportunity work in practice?**

Some of the flood defences budget of the environment agency could be used to co-fund some of the schemes that might appeal to insurers. A good practice standard could be developed by national government to guide and certify those schemes meeting specified standards.

**6. What further EMTF research might help enable this opportunity?**

The Environment Agency or other body could produce overlays to flood risk maps to identify where enhancements to green infrastructure could deliver the biggest economic benefits through reduced risks to insurers. The social and ecological co-benefits could be considerable and government could identify where these are largest and deploy any incentives available to capture these.

## 6.2 Development of environmental bonds as vehicles for investment in nature

**Type:** 6 Financial and legal services, 2 Offsetting, 3 PES

**No:** T6.2

### 1. Please briefly describe the business opportunity

A number of asset classes such as biodiversity, water, carbon, which are co-located on the same area of land, could be 'stacked' and an environmental bond created, providing a stable investment return underpinned by, for example, government and/or private sector investors. These asset classes, as components of ecosystem markets, provide the natural capital on which society depends. Financing by government and/or the private sector in this way could leverage scaled-up investment that would help fund green growth and jobs. The underpinning might possibly be provided by the Green Investment Bank.

Environmental Finance is documenting a surge in interest in investment opportunities for assets linked to natural capital as the future cost of not accounting for this capital, which leads to its degradation on a massive scale, will be a constraint to the prosperity of future generations. It is argued that it is cheaper to invest now rather than face massive restorative costs and a dwindling set of essential resources.

There is significant experience of the integration of Payment for Ecosystem Services within REDD+ projects that have potential application for the UK:

- 1) by assessing the range of non-carbon goods and products and services that contribute value and income by locally generating sustainable alternative employment, e.g. honey production, pollination services;
- 2) by attracting overseas development aid money that creates the supporting infrastructure with schools and education, health and welfare, alternative energy technologies (solar/wind/hydro) which in the UK can be directed via the local authorities and planning consents;
- 3) by including the Intellectual Property in the information and images that support, for example, ecotourism and recreation, including inbound foreign tourism and social media publicity and promotion;
- 4) by mitigating financial risk through political and physical risk (catastrophic loss) insurance;
- 5) by harnessing City financial expertise to assess the ways that these blended revenue streams and securitizations enhance the ROI of an environmental bond.

### 2. What business sectors and/or types of business would this opportunity benefit?

Corporate industries wishing to purchase bonds as a means of offsetting their residual environmental impacts through the supply chain, giving them a competitive advantage. Financial institutions looking for stable returns, for example for pension funds. Already companies are looking to secure bond offers, e.g. M&S, Sainsbury's, etc. – No actual evidence yet of bond take-up; supermarkets are totally obsessed with carbon reduction down the supply chain.

**3. What is the potential size of the market for this business opportunity?**

Likely to be large and gain momentum once first few are established, for example upland environmental bond for carbon, biodiversity, flood risk mitigation, water quality. Potentially £5-10+bn / yr trade.

**4. How would this business opportunity benefit ecosystems?**

Through provision of restoration finance to reduce carbon emissions (peatland re-wetting), improving water quality and quantity, reducing flood damage and helping with flood risk management, and all of these would provide biodiversity benefits and the recreational benefits that accrue to restored landscapes and habitats.

**5. What actions (policy, regulatory, incentives, etc.) might be needed to make this opportunity work in practice?**

Financial investment and infrastructure guarantees to underpin the bond revenue. A mandatory requirement on the part of companies above a certain size to offset emissions through the Climate Reduction Commitment thereby allowing or requiring companies to account for carbon and ecosystem bond offsetting on their balance sheets.

**6. What further EMTF research might help enable this opportunity?**

How to structure a bond using: a) government finance incentives; b) taxation benefits; c) stacking different asset classes; d) Payment for Ecosystem Services as the UK corollary of overseas REDD projects with the additional benefit of using the EMTF research as a platform for the international application of UK expertise in structuring and selling worldwide a new class of environmental financial instrument as a forest and/or ecosystem bond derivative of a climate bond.

## 7 ECOSYSTEMS KNOWLEDGE ECONOMY

### 7.1 *Developing the UK Ecosystems knowledge economy*

**Type:** 7 Ecosystem knowledge economy

**No:** T7.1

**1. Please briefly describe the business opportunity**

Ecosystems provide opportunities to develop knowledge based businesses providing high quality employment and growth opportunities. The UK plays a leading role internationally in ecosystem related knowledge and is the first country to have published a national ecosystems assessment. There is an opportunity to build on this knowledge base and to strengthen collaboration between business and knowledge based institutions in order to maximise business opportunities. The aim would be to position the UK as an international leader in knowledge based goods and services contributing to the protection of ecosystems and the sustainable use of ecosystems and their services. This could build on existing initiatives to maximise the opportunities for the green economy from the UK ecosystems knowledge base.

**2. What business sectors and/or types of business would this opportunity benefit?**

All sectors.

**3. What is the potential size of the market for this business opportunity?**

The UK already has numerous knowledge based businesses focusing on ecosystem related issues – the intention would be to encourage further business growth focusing on the UK knowledge base. This could have a number of different elements:

- Research and knowledge development on ecosystems and their services;
- Skills and training initiatives, including positioning UK as an international centre of excellence;
- R&D focused on business opportunities that enhance ecosystems and benefit from the sustainable use of ecosystem services;
- Business/ HE collaboration and knowledge transfer networks;
- Development and application of knowledge required to underpin other ecosystem market opportunities (e.g. certification, PES, offsets etc).

This opportunity will create business opportunities itself (in research, training, R&D, consultancy etc) as well as supporting other ecosystem based business opportunities (including most of the other ecosystem market opportunities identified by the NEA and relevant to the EMTF). This it provides both a growth opportunity as well as an enabler for other ecosystem market opportunities.

**4. How would this business opportunity benefit ecosystems?**

Knowledge plays a key role in underpinning actions to enhance ecosystems and their services, as well as business opportunities that enhance them.

**5. What actions (policy, regulatory, incentives, etc.) might be needed to make this opportunity work in practice?**

To move this opportunity beyond a concept and to deliver real benefits, it is likely that

a broad agenda for action will be needed, involving partnerships between government, the research and education sectors, and business. As well as actions designed to develop and apply knowledge on ecosystems and their services, the opportunity would be more likely to be realised if further steps were taken to integrate ecosystems based knowledge into decision making, for example by:

- Developing and implementing initiatives on biodiversity offsets, Payments for Ecosystem Services, and ecosystems related certification schemes.
- Requiring assessments of impacts on ecosystems and their services as part of Environmental Impact Assessments;

Engaging with major companies on ecosystems issues. This would benefit from the involvement of other Government departments (BIS and HM Treasury as well as Defra).

**6. What further EMTF research might help enable this opportunity?**

Further elaboration of types of opportunity, key players, potential actions and arrangements to stimulate this opportunity.

## 8 CORPORATE ECOSYSTEM INITIATIVES

### 8.1 *Business to business ecosystem services assurance*

<b>Type:</b> 8 Corporate Ecosystem Initiatives	<b>No:</b> T8.1
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**1. Please briefly describe the business opportunity**

While there is extensive discussion of certification of consumer products based on their ecosystem services impacts, there is little business to business activity in this area. Supply chain impacts (e.g. water impacts) are becoming more understood, and there is capacity for standards (e.g. by ISO) in this area, at least of processes required, if not of outcomes.

**2. What business sectors and/or types of business would this opportunity benefit?**

Cross-cutting for suppliers to many manufacturing and other business sectors. Also very relevant to public sector as it may make placing environmental conditions on public procurement easier if these can be linked to an ISO standard.

**3. What is the potential size of the market for this business opportunity?**

Very large, as it can encompass many supply chains.

**4. How would this business opportunity benefit ecosystems?**

Through greater stewardship of supply chains, and more transparent information about the impacts of business purchases.

**5. What actions (policy, regulatory, incentives, etc.) might be needed to make this opportunity work in practice?**

Development and promotion of standards for business to business assurance of ecosystem impacts, as part of corporate ecosystem management and risk-management activities.

**6. What further EMTF research might help enable this opportunity?**

Identifying areas where public procurement can utilise this process. Promote business to business responsibilities.

## 8.2 Assurance of corporate reporting activity

Type: 8 Corporate Ecosystem Initiatives

No: T8.2

**1. Please briefly describe the business opportunity**

Corporate reporting on environmental impacts remains largely based on self-selected scope and conclusions. Assurance of these reports to make them more reliable to third parties would strengthen corporate image in relation to their value.

**2. What business sectors and/or types of business would this opportunity benefit?**

All sectors, corporate scale.

**3. What is the potential size of the market for this business opportunity?**

Large as a proportion of the existing CSR reporting market.

**4. How would this business opportunity benefit ecosystems?**

By forcing CSR reporting to take ecosystem impacts more seriously as part of reporting it could drive good practice in ecosystem protection, reducing greenwash.

**5. What actions (policy, regulatory, incentives, etc.) might be needed to make this opportunity work in practice?**

Encouragement for assurance (possibly through an incentive scheme). Some corporate leadership from early-movers.

**6. What further EMTF research might help enable this opportunity?**

Research on the benefits of assurance of corporate reporting.



## **ANNEX 1B – IDEAS SUBMITTED BY WORKSHOP PARTICIPANTS & MAILING LIST RECIPIENTS**

The following ideas for business opportunities were submitted by workshop participants on 30 April 2012, or by other mailing list recipients in response to an invitation to submit ideas. We were not able in the available time to review or assess these in any way. We present the ideas here in anonymous form; however, should EMTF wish to pursue any of these opportunities, we can supply contact details of proposers.



# 1 PRODUCT MARKETS

## 1.1 *Developing new market opportunities from organic farming*

Type: 1 Product markets

No: S1.1

### 1. Please briefly describe the business opportunity

Initial research by an organic farming group suggests that organic farming management practices increase the organic content of farmed soils and therefore sequester carbon. This sequestered carbon can be offered as voluntary carbon credits or off-sets to 'carbon emitting companies,' with investment from credits reinvested by participating farmers to increasing 'soil carbon,' i.e. through using different plant species, cultivations and management practices etc, which aid soil organic matter increases and hence soil carbon.

This new market opportunity seeks to

- enable a source of carbon off-setting or credits within the regions/local area in which emissions are generated
- gives partnering businesses an opportunity to invest in environmental 'goods' within their locality in addition to 'green marketing opportunities'
- provide an income stream to participating organic farmers providing 'positive feedback' increasing the positive environmental impacts of organic farming
- provides an diversifying income stream to participating organic farmers recognising the wider ecosystem services provided by organic farming over and above intensive/non-organic farming
- provides a model that could be extended to other ecosystem services i.e. flood management and water filtration

### 2. What business sectors and/or types of business would this opportunity benefit?

The business would initially benefit members of organic farming groups and partnering businesses that seek to purchase voluntary carbon credits or off-sets (i.e. through 'green marketing and publicity opportunities.')

There are clear future business benefits through extending the scope of the scheme to other organic farms and extending services to an international level.

Whilst such carbon off-setting would not be compliant in terms of legally recognised carbon off-setting schemes, further research and advocacy might see soil management and carbon sequestration as a legally recognised carbon off-setting service.

Potential additional future business benefits could be accrued through recognising and developing markets for other ecosystem services supported by organic farming, i.e. flood and water management, cultural/tourism services, nutrient management, etc.

### 3. What is the potential size of the market for this business opportunity?

There are approximately 300,000 UK farms with an average size of around 57 hectares,

with organic farming representing around 4% of the UK total.

Different soils and management techniques have different impacts in their ability to sequester carbon. However activities such as improved crop production and erosion control, conservation agriculture, conservation tillage, composting, nutrient and water management, grazing management etc can independently deliver potential carbon soil sequestration rates of between 0.05 – 0.3 t C ha/year.

The UK Government in 2009 reviewed the approach to valuing carbon in 2009 moving from the shadow price of carbon (identified within the Stern Review), moving to a 'traded price of carbon' (for sectors covered by the EU Emissions trading Scheme) and 'non-traded price of carbon' (for sectors not-covered by the EU ETS), the 2020 short term price of carbon in 2020 is understood to be £25 and £60 per tonne of CO<sub>2</sub>e, respectively.

Using a conservative carbon sequestration rate of 0.15 t C ha/year and using the 'non-traded price of carbon' in 2020 and applying this across the whole UK organic farming sector this could equate to a turnover of £6,156,000 per annum.

**4. How would this business opportunity benefit ecosystems?**

- Sequester carbon
- Make organic farming more commercially viable / attractive
- Potential to develop new markets beyond carbon i.e. flood management , nutrient management, cultural services
- Develop spin-out benefits in terms of biodiversity protection and enhancement etc
- Value the wider benefits of farming in addition to food productivity

**5. What actions (policy, regulatory, incentives, etc.) might be needed to make this opportunity work in practice?**

At present such a scheme would have to operate through a voluntary carbon credit/off-setting code. More research and policy development would be required to officially include soil management/carbon sequestration as an official carbon trading/off-setting mechanism.

**6. What further EMTF research might help enable this opportunity?**

- Greater research around the regulatory and policy barriers around implementation
- Greater research, authentication and validation of the carbon sequestration levels assigned to different management techniques and initiatives, across different soil types and assessment of impact over time

## 1.2 Conservation Grade – nature-friendly farming

Type: 1 Product markets

No: S1.2

### 1. Please briefly describe the business opportunity

Conservation Grade is an evidence-based accreditation protocol under which farmers and growers create, protect and manage biodiversity on farmland. Conservation Grade-accredited farmers derive a premium from food manufacturers licensed by the company for creating and maintaining scientifically-designed habitats that are independently audited by NSFCMi. Given its unique business platform and due to the increased prominence given to the sector by TEEB, the Foresight Report, NGOs and others, Conservation Grade is poised for significant growth and would welcome interest from potential investors.

### 2. What business sectors and/or types of business would this opportunity benefit?

The food, textile, alcoholic beverage and farming sectors; as well as government and NGOs (through the mobilisation of consumer spending to augment taxpayer and philanthropically-funded biodiversity conservation).

### 3. What is the potential size of the market for this business opportunity?

TEEB identifies this as US\$56,000 million in 2010 (actual); US\$98,000 million in 2013; and US\$261,000 million in 2020. This larger than any other biodiversity-related market or finance TEEB has identified. Conservation Grade is poised to be a major beneficiary of this opportunity and would welcome interest from potential investors

### 4. How would this business opportunity benefit ecosystems?

The Conservation Grade business model derives its financial reward by creating, conserving and managing biodiversity on farmland. Having scrutinised Conservation Grade's evidence base, TEEB, Natural England and the RSPB recognise that it is a unique market-based mechanism that significantly benefits ecosystems and biodiversity and is clearly legible to consumers through the activities of commercial brands.

### 5. What actions (policy, regulatory, incentives, etc.) might be needed to make this opportunity work in practice?

The UK government, through Conservation Grade's recent MoU with Natural England, already recognise its unique position in the marketplace. This needs to be given more prominence by government, the NGO sector and business in order to attract the necessary investment required to realise Conservation Grade's global potential. The EMTF could assist significantly by facilitating this.

### 6. What further EMTF research might help enable this opportunity?

Conservation Grade already conducts significant cooperative research in its sector with a range of institutions. These include the Universities of Reading, East Anglia and Southampton, Rothamsted Research, Natural England, the RSPB and the Game and Wildlife Conservation Trust. Additional resources and cooperative involvement by EMTF in this leading-edge UK research would be most welcome.

### 1.3 Making the most of UK biomass woodlands

Type: 1 Product markets

No: S1.3

**1. Please briefly describe the business opportunity**

Optimising appropriate land to produce biomass/co-produce for heating systems – decentralised/district land.

**2. What business sectors and/or types of business would this opportunity benefit?**

Public sector (hospitals, care homes, leisure, schools ), agricultural land owners/users

**3. What is the potential size of the market for this business opportunity?**

Unsure

**4. How would this business opportunity benefit ecosystems?**

Drive better managed woodland/coppicing. Drive better national appraisal of suitability of land for different crops and drive opportunities for co-product generation for biomass energy.

**5. What actions (policy, regulatory, incentives, etc.) might be needed to make this opportunity work in practice?**

Unsure but a nascent market so identify and address factors constraining expansion

**6. What further EMTF research might help enable this opportunity?**

Bring current knowledge together in one place, incentivise key players in supply chain and demand space. Identify benefits for ecosystem services aside from heat generation (water flow control, biodiversity, green space)

## 1.4 *Trees help us breathe (THUB)*

Type: 1 Product markets

No: S1.4

**1. Please briefly describe the business opportunity**

Each product or service sold that signs up to THUB creates a payment in to a central pot. The pot identifies and funds projects that benefit ecosystem services – customers can choose projects to benefit, and receive news on progress.

**2. What business sectors and/or types of business would this opportunity benefit?**

Business to business, or business to customer products and services that want to add value to what already doing, sell more products

**3. What is the potential size of the market for this business opportunity?**

Small to large

**4. How would this business opportunity benefit ecosystems?**

Invest in those projects that help encourage understanding of ecosystems – could apply to multiple ecosystems

**5. What actions (policy, regulatory, incentives, etc.) might be needed to make this opportunity work in practice?**

Central body like retail consortium to coordinate multiple retailers

**6. What further EMTF research might help enable this opportunity?**

## 1.5 Green gateway initiative for micro-clusters

Type: 1 Product markets

No: S1.5

**1. Please briefly describe the business opportunity**

A light-touch mechanism to initiate local clusters of businesses to link together via procurement and tourist accommodation certification/green rating

**2. What business sectors and/or types of business would this opportunity benefit?**

SMEs with limited marketing resources – restaurants, B&Bs, independent hotels

**3. What is the potential size of the market for this business opportunity?**

Limited by extent to which rural economies able to provide produce direct and by extent to which green tourism might represent a unique selling point.

**4. How would this business opportunity benefit ecosystems?**

Support to local ecosystems through less intensive agriculture, able to support rural economies at micro-scale, reduce need to travel

**5. What actions (policy, regulatory, incentives, etc.) might be needed to make this opportunity work in practice?**

Low cost certification, internet resources, mapping capabilities

**6. What further EMTF research might help enable this opportunity?**

Work with tourism sector, agriculture, retail (butchers, grocers, etc.) – research needed to identify business clusters

## 1.6 Woodland management cooperatives

Type: 1 Product markets

No: S1.6

**1. Please briefly describe the business opportunity**

Too many woods are too small to manage/market effectively

**2. What business sectors and/or types of business would this opportunity benefit?**

Advisory/facilitating, timber contractors, users, mills, local people

**3. What is the potential size of the market for this business opportunity?**

Large – 500,000 ha

**4. How would this business opportunity benefit ecosystems?**

Managed woods benefit wildlife, control water flows, fix carbon, offer public/private recreation/enjoyment

**5. What actions (policy, regulatory, incentives, etc.) might be needed to make this opportunity work in practice?**

Beneficial taxation, capital grants

**6. What further EMTF research might help enable this opportunity?**

Demonstration sites, champions

### 1.7 Ecofuel based on farm CO2 production (air synthesis)

Type: 1 Product markets

No: S1.7

**1. Please briefly describe the business opportunity**

This product can be produce in laboratory quantities but needs to be tested in volume production

**2. What business sectors and/or types of business would this opportunity benefit?**

Most

**3. What is the potential size of the market for this business opportunity?**

Unlimited

**4. How would this business opportunity benefit ecosystems?**

Produces green energy

**5. What actions (policy, regulatory, incentives, etc.) might be needed to make this opportunity work in practice?**

Funding help for research

**6. What further EMTF research might help enable this opportunity?**

## 1.8 Smarter showers

Type: 1 Product markets

No: S1.8

**1. Please briefly describe the business opportunity**

Service for installing low flow/more efficient shower heads and information on the financial and environmental impacts of installing and on how to save energy/water elsewhere in the home

**2. What business sectors and/or types of business would this opportunity benefit?**

Water/energy companies, DIY providers, shower companies,

**3. What is the potential size of the market for this business opportunity?**

?

**4. How would this business opportunity benefit ecosystems?**

Reduce energy and water use, reduce greenhouse gas emissions, water treatment

**5. What actions (policy, regulatory, incentives, etc.) might be needed to make this opportunity work in practice?**

Might also introduce wider water metering, smart meters, link to Green Deal

**6. What further EMTF research might help enable this opportunity?**

?

## 1.9 Waste as a product/resource

Type: 1 Product markets

No: S1.9

**1. Please briefly describe the business opportunity**

Turning what would be considered waste into a new product (same thing) or something different

**2. What business sectors and/or types of business would this opportunity benefit?**

Consumer goods, retail, waste

**3. What is the potential size of the market for this business opportunity?**

Significant

**4. How would this business opportunity benefit ecosystems?**

Waste has a value – change behaviour of ‘throw away society’ - turned into a valuable resource, reduced landfill

**5. What actions (policy, regulatory, incentives, etc.) might be needed to make this opportunity work in practice?**

Remove legislative constraints, facilitate collection, treatment, re-engineering

**6. What further EMTF research might help enable this opportunity?**

Examples of this already but need research on how to apply more widely, expand and fully capitalise the market opportunities

## 1.10 Product certification to green supply chains & promote data sharing

Type: 1 Product markets

No: S1.10

**1. Please briefly describe the business opportunity**

(1) access to credible and responsible operating framework, (2) reputational, (3) access to market, (4) protection of critical ecosystem services, (5) data for business strategy development

**2. What business sectors and/or types of business would this opportunity benefit?**

Primary producers across all sizes and geographical regions

**3. What is the potential size of the market for this business opportunity?**

Immense provided development is matched by consumer education

**4. How would this business opportunity benefit ecosystems?**

Adoption of more biodiversity and ecosystem services (BES) centric management approach; BES protection explicitly targeted; reporting and increased understanding of land-use trends and BES status.

**5. What actions (policy, regulatory, incentives, etc.) might be needed to make this opportunity work in practice?**

Better dissemination, information, capacity building; incentives for certified products

**6. What further EMTF research might help enable this opportunity?**

Research into BES indicators for standards. Strong process for certification auditing. Central body to manage data collected

## **2 OFFSETTING**

No additional ideas submitted

### 3 PAYMENT FOR ECOSYSTEM SERVICES

#### 3.1 *Promote and capitalise on local concern for & use of the natural environment*

Type: 1 PES	No: S3.1
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**1. Please briefly describe the business opportunity**

To develop some form of payment that will enhance local use (and ownership) of the natural environment

**2. What business sectors and/or types of business would this opportunity benefit?**

No pre-conceptions – to be confirmed

**3. What is the potential size of the market for this business opportunity?**

If it can be harnessed, it is as large as the level of concern shown when the Forestry Commission was to be privatised/sold?

**4. How would this business opportunity benefit ecosystems?**

It will help to protect sites under pressure ('honeypots') in National Parks. It will cut down on travel

**5. What actions (policy, regulatory, incentives, etc.) might be needed to make this opportunity work in practice?**

Localism? To be confirmed

**6. What further EMTF research might help enable this opportunity?**

Check out Dutch example mentioned in workshop morning break-out group 5

## **4 ENVIRONMENTAL TECHNOLOGIES**

No additional ideas submitted

## **5 MARKETS FOR CULTURAL SERVICES**

No additional ideas submitted

## 6 FINANCIAL AND LEGAL SERVICES

### 6.1 *Sub-national rainforest bonds*

Type: 6 Financial & legal services

No: S6.1

**1. Please briefly describe the business opportunity**

Investing in protecting rainforests and sustainable ecosystem management

**2. What business sectors and/or types of business would this opportunity benefit?**

Banking, hedge funds, sustainable products

**3. What is the potential size of the market for this business opportunity?**

If scaled, £25 billion/yr (which would halve deforestation by 2030)

**4. How would this business opportunity benefit ecosystems?**

Keep rainforests standing which aids in carbon sequestration, water regulation, sustainable forest products, climate regulation, etc.

**5. What actions (policy, regulatory, incentives, etc.) might be needed to make this opportunity work in practice?**

Tax incentives for forestry investments, aid to rate forestry investments as investment grade, promoting pilots

**6. What further EMTF research might help enable this opportunity?**

Helping to research sustainable revenue sources from sustainable management of forests. Encouraging business to fund pilots. Raising awareness regarding value of standing forests.

## 7 ECOSYSTEMS KNOWLEDGE ECONOMY

### 7.1 *What is sustainable development?*

**Type:** 7 Ecosystems knowledge economy

**No:** S7.1

**1. Please briefly describe the business opportunity**

The National Planning Policy Framework places a presumption in favour of sustainable development and focuses on growth. However as several VERY recent planning applications show, the metrics and monetised value of ecosystems are contested and often under-considered in decision-making.

**2. What business sectors and/or types of business would this opportunity benefit?**

The development, planning and environmental consultancy as well as general management consultancy sectors will benefit.

**3. What is the potential size of the market for this business opportunity?**

In terms of services rendered ca. £50M/ year and in terms of the value of ecosystems to be considered ca 5B/ year

**4. How would this business opportunity benefit ecosystems?**

It would give them a stronger focus in land use planning decision making and in investment appraisal.

**5. What actions (policy, regulatory, incentives, etc.) might be needed to make this opportunity work in practice?**

NONE!

**6. What further EMTF research might help enable this opportunity?**

Research on the range of ecosystem services offered by green field, white land, green belt land that is being considered for development.

## 7.2 Market intelligence

Type: 7 Ecosystems knowledge economy

No: S7.2

**1. Please briefly describe the business opportunity**

Need for assurance on business performance in relation to impact on ecosystem services

**2. What business sectors and/or types of business would this opportunity benefit?**

Investors and analysts

**3. What is the potential size of the market for this business opportunity?**

Multi millions

**4. How would this business opportunity benefit ecosystems?**

By rewarding business performance through the market

**5. What actions (policy, regulatory, incentives, etc.) might be needed to make this opportunity work in practice?**

Benchmarking and quality assurance mechanisms will be required that relate to agreed standards

**6. What further EMTF research might help enable this opportunity?**

Scope gaps in current data provision and standards relating to environmental performance

### **7.3 ES performance standard setting, conformity, registration & administration**

**Type:** 7 Ecosystems knowledge economy

**No:** S7.3

**1. Please briefly describe the business opportunity**

The setting, verification and monitoring of appropriate performance standards in ecosystem service use and enhancement

**2. What business sectors and/or types of business would this opportunity benefit?**

Investors and analysts, consumers

**3. What is the potential size of the market for this business opportunity?**

Multi millions

**4. How would this business opportunity benefit ecosystems?**

By rewarding business performance against agreed standards

**5. What actions (policy, regulatory, incentives, etc.) might be needed to make this opportunity work in practice?**

Standard setting, maintenance of standards, registration and verification

**6. What further EMTF research might help enable this opportunity?**

Identify what criteria would be in an ecosystem service performance standard

## 7.4 Citizen science

Type: 7 Ecosystems knowledge economy

No: S7.4

**1. Please briefly describe the business opportunity**

The mobilising and participation of consumers in supporting business's with profiles of positive relationships with ecosystems

**2. What business sectors and/or types of business would this opportunity benefit?**

Media, educational sector

**3. What is the potential size of the market for this business opportunity?**

Multi millions

**4. How would this business opportunity benefit ecosystems?**

An educated consumer positively interacts in the market place with business's that protect and enhance ecosystem services

**5. What actions (policy, regulatory, incentives, etc.) might be needed to make this opportunity work in practice?**

Standard setting, maintenance of standards, registration and verification

**6. What further EMTF research might help enable this opportunity?**

Identify the role of consumers in supporting positive business interactions with ecosystems

## **8 CORPORATE ECOSYSTEM INITIATIVES**

No additional ideas submitted

## 9 OTHER, INCLUDING GOVERNMENT INCENTIVES, SUBSIDIES, GRANTS, PLANNING

### 9.1 Red tape reduction for market innovation

Type: 9 Other

No: S9.1

#### 1. Please briefly describe the business opportunity

Many businesses argue that they have products, services or processes with lower ecosystem impacts (e.g. lower carbon content, lower water use), but they face many challenges to gain market access and grow the market potential.

One of the obstacles may be the time and cost involved in complying with government regulatory requirements. We believe that a trial could run by the government to offer red tape reductions for businesses with genuine proposals for products, service or process innovation which provide ecosystem benefits. This may reduce barriers to entry and/or cost of compliance for business innovation.

#### 2. What business sectors and/or types of business would this opportunity benefit?

All sectors.

#### 3. What is the potential size of the market for this business opportunity?

Substantial, potentially greater than £1billion.

#### 4. How would this business opportunity benefit ecosystems?

This would depend on the type of product, service or processes being proposed.

An example might be a water company which wants to spend £20m on innovative demand management which generates a range of ecosystem benefits as well as economic and social benefits. The demand management may reduce the pressure on existing water infrastructure; it may help reduce water cost and security-of-supply risks for major water users; it may improve water quality and water quantity in waterways; it may reduce carbon emission levels in water treatment systems, etc.

If the water company is willing to take this type of innovative approach as an alternative to traditional infrastructure solutions, could the government give it a commitment to reduce the time taken for its various statutory approvals by half? For example, if an Act gives a particular regulatory agency a maximum of 6 months to make a determination on the water company's application, could this be reduced to 3 months for this proposal provided the company submits an adequate application?

This simple approach of cutting the time taken to make regulatory decisions could be applied to any business innovation that has an ecosystem benefit and requires one or more statutory approvals. This water example is a process example, but the idea could just as readily apply to a product or service proposal.

**5. What actions (policy, regulatory, incentives, etc.) might be needed to make this opportunity work in practice?**

Our policy suggestion is for the UK Government to conduct a high-profile trial of offering red tape reductions for product, service or process innovations that have a significant potential ecosystem services benefit.

This would involve the Government announcing that it will guarantee a 50% reduction in the time taken for regulatory approvals for the best 10 proposals submitted for products, services or processes which have the potential for: (1) Significant ecosystem benefits, and (2) Significant market growth.

The trial would be low-cost for government. Apart from the design of the trial and some oversight and guidance, there would be almost no cost as it simply involves various regulatory agencies making quicker decisions than they otherwise would.

A small advisory panel of policy/regulatory officers, NGO representatives and independent experts could advise on the suitability of the proposals submitted.

**6. What further EMTF research might help enable this opportunity?**

The most helpful work would be applied research to construct and design the trial parameters. This could involve working with (1) policy and regulatory agency officers (2) regulatory reform experts.

## 9.2 Green innovation purchasing trial

Type: 9 Other

No: S9.2

### 1. Please briefly describe the business opportunity

Many businesses argue they have products and services which have lower ecosystem impacts (e.g. lower carbon content, lower use of virgin materials) and that their key market challenge is gaining initial access to market, especially at enough scale to provide adequate initial returns and momentum. We believe a more targeted use of government purchasing policies may be one way to help unlock these opportunities.

### 2. What business sectors and/or types of business would this opportunity benefit?

All sectors.

### 3. What is the potential size of the market for this business opportunity?

Substantial, potentially greater than £1billion.

### 4. How would this business opportunity benefit ecosystems?

This would depend on the type of products and services sold. Examples could include low emission vehicles (lower carbon and other air pollutants), smart travel systems for staff (lower carbon, reduced pressure on transport infrastructure leading to lower, materials, water and carbon, etc), light-material chairs (lower materials and carbon), etc.

### 5. What actions (policy, regulatory, incentives, etc.) might be needed to make this opportunity work in practice?

Governments in many jurisdictions, including the UK, have often introduced “green purchasing policies” or “sustainable development purchasing policies”. These policies have mixed records. Often, the generality of the requirements mean that purchasing officers in government agencies do not have to do very much to comply with the requirements and this means that purchasing decisions do not change much unless there is strong enthusiasm or interest from a particular department or agency.

Our policy suggestion is for the UK Government to conduct a high-profile trial of a more effective “Green Purchasing Policy”.

This would involve the Government setting aside an amount of money (say £50m) for purchasing decisions designed to support the market development and uptake of business ideas which have the potential for: (1) Significant ecosystem benefits, and (2) Significant market growth.

The trial would not involve new government funding. Instead, the £50m would be drawn from existing funds that are assigned for purchasing decisions across government departments and agencies.

A call would be made for proposals from UK businesses for government to purchase products or services which meet existing government programme needs in a way that:

(1) Leads to a significant ecosystem benefit (i.e. reduces pressure on UK ecosystems); (2) Helps take new product or service offerings to a scale that provides a good chance of creating long-term market viability (i.e. helps create green growth); (3) Meets existing core government programme needs (i.e. help deliver existing policy priorities); (4) The price of the product/service can be no more than 10% above existing market prices, though preference will be given to products/services which offer the same or lower prices. If not, the proponent must demonstrate either extra value or a plan for a future reduction in prices.

A small Advisory Panel of government purchasing officers and business experts would be established to help assess the proposals and advise government departments and agencies on whether and how to accept individual proposals.

**6. What further EMTF research might help enable this opportunity?**

The most helpful work would be applied research to construct and design the trial parameters. This could involve working with (1) government purchasing officers (2) business purchasing officers and (3) business people who have experienced challenges in getting new 'green' products and services to market.

### 9.3 The city model

Type: 9 Other

No: S9.3

**1. Please briefly describe the business opportunity**

Joint investment and joint decision-making over future running/development of a city

**2. What business sectors and/or types of business would this opportunity benefit?**

Small to large – based on willingness to engage ('pioneers')

**3. What is the potential size of the market for this business opportunity?**

Works at two scales: (1) the individual city and its markets, (2) global replicability (huge potential!)

**4. How would this business opportunity benefit ecosystems?**

Better serve the participating city's own ecosystem and those of its ecological footprint.

**5. What actions (policy, regulatory, incentives, etc.) might be needed to make this opportunity work in practice?**

Demonstrating through an effective pilot city from which incentives and future policy could be drawn

**6. What further EMTF research might help enable this opportunity?**

A 6-12 month EMTF intern with a pilot UK city (Birmingham) and close monitoring, support and feedback, evaluation – could be a first for UK and global first.

## 9.4 *Eco-enterprise development*

Type: 9 Other

No: S9.3

1. Please briefly describe the business opportunity

Re-use of horticultural plants

2. What business sectors and/or types of business would this opportunity benefit?

Public sector – operators of parks and gardens

3. What is the potential size of the market for this business opportunity?

Small!

4. How would this business opportunity benefit ecosystems?

Re-use of plants reduces emissions and imports

5. What actions (policy, regulatory, incentives, etc.) might be needed to make this opportunity work in practice?

6. What further EMTF research might help enable this opportunity?

Research on buying and disposal practices of local authorities, opportunities for local job creation (small-scale, social enterprise)



## **ANNEX 2 – WORKSHOP: OPPORTUNITIES FOR UK BUSINESS THAT VALUE AND/OR PROTECT NATURE’S SERVICES**

In this annex, we provide the workshop programme, list of workshop participants, and a summary of the discussion from the break-out sessions, containing various business ideas and related considerations.



# PROGRAMME

## WORKSHOP

### Opportunities for UK business that value and/or protect nature's services

Monday 30<sup>th</sup> April 2012, 09:00-16:45  
Imperial College London, South Kensington Campus, London

**09:00-10:00 Registration, refreshments**

**10:00-10:45 PLENARY 1 – INTRODUCTORY (Chair – G Duke)**

10:00-10:10 Welcome, introduction to the study – G Duke, Principal Investigator

10:10-10:20 Overview of analysis of the NEA – M Rayment

10:25-10:35 Emerging business opportunities, workshop structure – T Juniper

10:35-10:45 Examples of business opportunities – K ten Kate, M Rafiq

**10:45-11:15 Refreshments**

**11:15-12:45 BREAK-OUT SESSION 1**

Discussion of long-list of emerging business opportunities (based on Discussion Paper, *Table 9*), filling of gaps.

**12:45-13:45 Lunch**

**13:45-14:15 PLENARY 2 (Chair – T Juniper)**

Report back to plenary from Break-out Session 1, introduction to afternoon break-out sessions

**14:15-15:45 BREAK-OUT SESSION 2**

Identification of most promising opportunities in terms of market and ecosystems potential (based on ideas presented in Discussion Paper, *Annex 1*, and other opportunities identified in morning session). For most promising opportunities, identification of required enabling actions and possible further work for EMTF to pursue to develop the idea further.

**15:45-16:15 Refreshments**

**16:15-16:45 PLENARY 3 (Chair – G Duke)**

Feedback from Break-out Session 2 – presentation of most promising opportunities. Closing statement from David Hill, EMTF member.



## PARTICIPANTS

	<b>Surname</b>	<b>First name</b>	<b>Position</b>	<b>Organisation</b>
1	Abbott	Stan	Environment and Planning Manager	Forestry Commission
2	A'Hearn	Terry	Director, Global, Regulatory Innovation, Climate Change & Sustainability Services	WSP Environment & Energy
3	Allen	Clare	Head Corporate Fundraising	Woodland Trust
4	Atkinson	Nick	Carbon Specialist	Woodland Trust
5	Austin	Alison	Co-founder	Robertsbridge Group
6	Bailey	Estelle	CEO	Montgomeryshire Wildlife Trust
7	Broetz	Georg		Imperial College
8	Caldecott	Ben	Head of European Policy	Climate Change Capital
9	Collyer	Claire	Conservation Officer	Country Landowners Association
10	Cooper	Miranda	Conservation Team Leader	Essex & Suffolk Water (Northumbrian Water Ltd)
11	Corker	Nicholas R.		Centre for Ecology & Hydrology
12	Coughlin	Deborah	Senior Research Fellow	Defra/Imperial
13	Culshaw	Faith	Team Leader, Knowledge and Partnerships	Natural Environment Research Council
14	Dickinson	Robin	Director	Green Growth International
15	Doyle	Alice		Mint Environment
16	Duke*	Guy		Independent
17	Duncan	Andy		Hanson UK
18	Dunn	Helen	Senior Economic Adviser	Defra
19	Evely	Anna	Research Fellow	University of Aberdeen Centre for Environmental Sustainability
20	Everard	Mark	Principal Scientist	Environment Agency
21	Evison	Will	Environmental Economist	PWC
22	Fenwick	Helen	Sustainable Living Plan Manager	Unilever
23	Fisher	Gerrard	Special Adviser (Electronic Products)	Waste & Resources Action Programme
24	Fleming-Williams	Victoria	Policy Officer	Aldersgate Group
25	Fletcher	John	Consultant	Independent
26	Frost**	Jack	Director	Johnson Matthey Fuel Cells
27	Grayson	Nick	Climate Change & Sustainability Manager	Birmingham City Council
28	Grossart	Duncan	Chairman	Mint Environment
29	Harlow	Julian		Natural England
30	Hill**	David	Chairman	The Environment Bank Ltd
31	Himes	Dr Stephanie	UK Lead Specialist - Biodiversity and Ecosystem Services	KPMG

	<b>Surname</b>	<b>First name</b>	<b>Position</b>	<b>Organisation</b>
32	Hodgson	Zoe	EMTF Secretariat	Defra
33	Hughes	Brian	Agri-environment Adviser	Conservation Grade
34	Innes	Claudia	Biodiversity Strategy Manager	Thames Water
35	Juniper*	Tony		Independent
36	Kakkad	Jeegar	UK Government Affairs Manager	Jaguar Land Rover
37	Karpowicz	Zbig	Programme Coordinator	RSPB
38	Lacey	Gemma	Head of CSR	Waitrose
39	Lavers	Anthony	PhD Student	Imperial College, CEP
40	Looi	Simone	Corporate Responsibility Manager	Veolia Environmental Services
41	Maxwell	Dr Dorothy	Special Adviser, Global Business Alliance	Prince's Charities' International Sustainability Unit
42	Middleton	David	CEO	BCSD-UK
43	Miller	Anne	Knowledge Transfer Manager	Oxford University Department of Earth Sciences
44	O'Gorman	Stefanie	Principal Ecological Economist	Jacobs Environmental Consultants
45	Parfitt	Julian	Principal Resource Analyst	Oakdene Hollins
46	Perepelov	Nik	Onshore Wind Development Manager	Renewable UK
47	Petley	Simon	Director	Enviromarket
48	Plester	Chris	Environmental Sustainability Business Adviser	National Grid
49	Rafiq*	Mohammad		Independent
50	Rayment*	Matt	Principal	GHK International
51	Raymond	Dhirani	Finance Policy Officer	WWF
52	Roberts**	Martin	Development Director	Cambridge Programme for Sustainable Leadership
53	Ross	Andrew	Chief Executive	Global Garden Ltd
54	Skolout	John	Research Support Assistant to Dr. N. Voulvoulis	Imperial College, Centre for Environmental Policy
55	Smethurst	Mark		EMTF & Natural Capital Committee
56	Smith*	Steven	Associate	URS
57	Snowdon	Pat	Head of Economics and Climate Change	Forestry Commission
58	Spurgeon	James	Director	SustainValue
59	Stevens	Chloë	Programme Officer, business, Biodiversity and Ecosystem Services	UNEP World Conservation Monitoring Centre
60	ten Kate*	Kerry		Independent
61	Thomas	Ruth	Environment Manager	International Council on Metals and Mining
62	Van Vliet	Wilbert	Biodiversity Unit	Institute for European Environmental Policy
63	Vlachopoulou	María	Research Support Assistant to Dr. N. Voulvoulis	Imperial College, Centre for Environmental Policy
64	Voulvoulis*	Nick	Reader in Environmental Technology	Imperial College, Centre for Environmental Policy
65	Waters	Ruth	Head of Profession, Ecosystem Approach	Natural England

\* Study team

\*\* EMTF member

# PROCEEDINGS

We present here notes from the morning and afternoon break-out sessions of the workshop. The morning session examined a draft long-list of business opportunities and participants were invited to comment on these and suggest additional opportunities under the various type headings presented in Part 3 of this report. The afternoon session examined opportunities under each of the types in more detail.

## A. GENERAL COMMENT

A number of more general comments were made which do not relate specifically to the nine 'types' of opportunity:

- We assume that there are potential market opportunities if we can identify values associated with ecosystems – and that there are barriers that need to be addressed to realise these. But we also need to question whether the absence of markets means that people are not actually willing to pay for the services on offer.
- The market opportunities identified focus very much on existing business models – but the scale of the problem suggests a need for a more fundamental change in our values and the way we do business. Need to consider broader change (including through education) as well as extension of existing markets.
- How can we promote innovation – possibility of relaxing regulation in cases where there is good practice in ecosystem management, to stimulate innovative approaches?
- Need to recognise overlaps and synergies between opportunities – they are not mutually exclusive and can reinforce each other.
- We shouldn't restrict ourselves to analysis of UK opportunities – we operate in global markets and we need global solutions to ecosystem pressures;
- Some of the opportunities identified are large scale and others are niche – need to get these in perspective.
- Social enterprise as a business model. It was argued that social enterprises could be a model for the delivery of market opportunities, and that they might provide lessons for attempts to develop ecosystem markets – for example the representation of farmers and other groups in PES schemes.
- Further recognition needed that land provides multiple benefits
- Whereas we can 'regulate tomorrow', developing markets requires a long lead in time
- Whereas people understand 'sustainable sourcing' they don't necessarily understand 'carbon'
- Can we better link the environmental and ethical agendas?

- From recent WBCSD event, surprised all members felt companies needed to get onboard with BES issues quickly. Also: relevant to all sectors. UK BCSD meeting revealed BES likely to be bigger than carbon for members.
- Hard to tell what the business opportunities are until there's more general awareness of the business case. Without this, companies don't screen their operations for BES risk and opportunity so aren't aware of risks and opportunities.
- Services sector – are they fully reflected in the framework? [Editors note: yes, included in or of relevance to most 'types' in the Part 3 typology]

## B. COMMENT BY TYPE OF OPPORTUNITY

### 1. PRODUCT MARKETS

#### Morning break-out notes

Opportunities include:

- What role for 'meta standards', i.e. standards for standards? We should capitalise on the fact that the UK already hosts international standards. What is the role of Government in increasing our market share? Standards can play a role in developing the ecosystems knowledge economy and can be rolled out abroad
- Nature-friendly labelling on clothing - what is increased demand? Market size?
- Investing in pollination (ecosystem service) to enhance crop output (product markets)
- Food re-use – and animal feed? (Perverse health regulation?)
- Lifecycle carbon sequestration products
- Horticultural development of UK native species, including peat replacements
- Genetic resources markets (bio-prospecting and bio-mimicry): either of UK genetic resources or UK business selling its expertise for international R&D. *(editorial note: there's presently no requirement or mechanism for benefit-sharing for biomimicry, as R&D doesn't necessarily involve accessing genetic resources so isn't covered under CBD Article 15 or the Nagoya Protocol. So this business opportunity presently wouldn't generate investment in conservation.)*

Regarding **certification**, the following comments were made:

- 430 certification schemes worldwide – market saturated? Need to re-shape, not add – different approach needed?
- While there is a proliferation of standards, the 'wrong places are certified' (e.g. bad fisheries, unsustainable forestry, do not apply for certification)
- Consolidation needed because proliferation of eco-labelling, all competing, different levels of credibility confusing for consumers
- Need more emphasis on demand side, not supply side (certification can be a distraction to the supply side, not dealing with the overall demand)

- UK expertise is strong
- Assurance of ecosystem services impacts of business to business transactions, options: (1) Absolute values – v. complicated to assess + audit; (2) Certification of a process – like ISO. Latter more workable as sets a framework but doesn't require absolute value. On certification, ISEAL is doing this – bringing together MSC, FSC, fair trade etc - Opportunity: to professionalise this. Set an agreed minimum standard across the board. Similar to ISO. *ISO is doing this now for water. EMTF recommendation could be for government to take a place in these discussions.*

### **Afternoon break-out notes**

12 participants were each asked to fill in a form presenting an idea for a market opportunity linked to product markets. They were then asked to present their idea briefly to the group. Participants were then asked to vote on which they thought were the most promising ideas. The four most popular ideas (biomass from woodlands, small woodland co-ops, sustainable showering and waste as a product/resource) were then explored further. The 12 ideas, not all of which relate directly to product markets, were as follows (See also **Annex 1B**):

#### **1. Biomass from woodlands**

UK woodlands are often under-managed. Using woods to produce biomass could enhance management, help to safeguard their future and reduce greenhouse gas emissions. This could include coppicing and other sustainable management techniques. There would be benefits for a wide range of ecosystem services – water regulation, biodiversity, etc.

Users could include heating systems in public buildings such as schools, hospitals as well as companies.

The demise of the paper sector in the UK may enhance supply of biomass.

Enablers – evidence, incentives, brokerage, co-operative approaches, payments for other ecosystem services to enhance viability, Renewable Heat Incentive – would benefit if included as an 'Allowable Solution' for zero carbon homes.

As many existing woods with potential to produce biomass are small and face economic barriers, the small woodland co-op idea below also links closely to this one. Security of supply is an issue – co-operatives could help here.

#### **2. Promoting use of natural sites by capitalising on local concern**

This would involve some form of payment for local use and ownership of the natural environment.

Public concern about proposed privatisation of Forestry Commission land highlights the value people place on their local natural environment

#### **3. Consumer Understanding of Ecosystems**

This idea would aim to fund awareness raising actions designed to enhance consumers' awareness of ecosystems.

It would raise a levy on transactions (business to business and business to consumer transactions) which would fund awareness raising measures

#### **4. Conservation Grade/ Nature Friendly Farming**

This is an existing certification scheme where farmers receive a premium from food manufacturers for creating and maintaining habitats. The scheme applies to food, textiles and alcoholic beverages. It delivers benefits for farmland birds and pollinators and potentially reduces the need for publicly funded agri-environment schemes. It has potential to grow rapidly and would benefit from information, awareness and knowledge transfer.

#### **5. Local accommodation and local economy**

This opportunity would strengthen links between local B&Bs, hotels, youth hostels and their local economies, engage them in greener purchasing and strengthen links to ecosystems. It would seek to develop local business clusters linked to ecosystems.

A local standard/accreditation system for local green purchasing would be developed, promoting demand for local sustainable produce and developing a gateway to the natural environment and landscape.

#### **6. Woodland Co-ops**

This opportunity would bring together owners of small woodlands that are too small to manage economically at present

It would create bigger parcels of timber with more market potential, as well as developing and sharing knowledge and offering economies of scale in production (e.g. through shared use of machinery, labour and transport)

It could be stimulated through grants, demonstration sites, financial and legal support

#### **7. Sub-National Forest Bonds**

It has been estimated that it will cost \$25 billion per annum to halve rates of deforestation globally. This opportunity would involve banks issuing bonds linked to the sustainable management of tropical forests.

#### **8. Eco-Enterprise Development**

This opportunity would involve practitioners and local businesses in capacity building and training activities designed to promote eco-enterprises, including social enterprises. It would aim to promote the skills and knowledge required for local entrepreneurship.

#### **9. Fuel based on Farm CO<sub>2</sub>**

This involves air fuel synthesis and is currently at the laboratory stage. If it could be produced at volume it would address global fuel problems and alleviate impacts on the environment.

#### **10. Smarter Showering**

Low flow shower heads reduce water and energy use and save consumers money, but rates of uptake are low. A service-based approach – involving a major business partner such as a water company or DIY chain – could stimulate uptake. This could be extended to wider household environmental management issues through a Green Deal approach.

Enablers – standards for rented accommodation, sustainability labelling for wider range of household goods including bathroom products, water using products, information and education.

## **11. Waste as a Product/ Resource**

More should be done to harness the value of waste as a resource and a product. A more creative and intelligent approach is needed to address this issue. Legislative barriers to enhanced use of waste need to be removed.

Food waste is a big issue – reducing it would alleviate pressure on ecosystems. Can we revisit use for animal feed? Re-examine animal by-product legislation?

Phosphorus cycle – harvesting and re-using phosphorus from STW?

Product re-use – e.g. consumer packaging. How to address barriers such as lack of consumer demand, concerns about product quality? Supermarket plastic bag reuse has increased, but that is easier than most other types of packaging.

Product design – e.g. pallets could be more easily recycled if didn't have nails.

Home composting schemes to replace green waste collection.

## **12. Product Certification – Data Sharing**

This opportunity would involve sharing of data about green supply chains linked to product certification schemes. It would provide evidence about the effects of primary producers on the natural environment and the impacts of certification. It could be facilitated through better information, capacity building and development of indicators.

## **2. OFFSETTING**

### **Morning and afternoon break-out notes combined**

#### ***Biodiversity offsets***

- Business opportunity presented in the report (T2.1) was supported by participants
- Biodiversity offsets could present a market opportunity of GBP1.4bn a year. However, this major opportunity will not be realised without an unambiguous policy requirement for local authorities to ensure developers deliver offsets. Now that PPS9 is no longer in force, there is no guidance for local authorities on their duty with respect to biodiversity and how to discharge it. Clarity would streamline planning processes and speed up investment.
- More work is needed on metrics, comparing the current Defra metric with other possible approaches.
- Need to explore stacking and bundling of different ecosystem benefits – carbon, water, biodiversity, etc.
- Need a simple system but based on science
- Having multi-stakeholder input to offset design helps avoid risks and gain support.
- It would be helpful to invest in getting the spatial data needed for biodiversity offsets: a system like an improved Magic (see Defra site), accessible to all, drawing on existing data under the Environmental Observation Framework etc. Research by NERC could help. This could focus on which data sets exist and what specific needs are, to develop a tool or

methodology to gather data for specific needs quickly. A pilot project to try this out (identifying needs and matching data) would be useful.

- Explore tools such as Cranfield's tool for mapping ecosystem services spatially. (They have a method of placing the potential development on GIS layers overlaying the mapped ecosystem services in order to determine the monetary value of the ecosystem services. Cost of doing this for UK would be huge.)
- Biodiversity offsets should include the marine biome. Offsets are needed for marine wind farms (bird-strike), but could provide conservation credits for fish and other species (as wind farms effectively become a no-take zone). Biodiversity offsets could also use trading up to invest offsets for marine impacts on coastal fringe habitat creation. The Crown Estates could play a role.
- Mixed terminology between offsetting and conservation/habitat banking
- Landowners/farmers don't know how to use it
- Offsets should be the 'last resort' at the end of the mitigation chain
- Peatland Carbon Code offers useful model for biodiversity
- Need to move from 'no net loss' to 'net gain'

#### ***Carbon offsets***

- Woodland Carbon Code: Woodland creation, reinstatement or management of woodlands. Want revised carbon reduction commitment like landfill tax where company could divert effort into domestic carbon abatement. Now, the market-place isn't big enough to make a difference. Although this is not a compliance market (yet), UK organisations such as the Forestry Commission have seen a large demand on the part of companies for CSR reasons wishing to show they are offsetting their footprints with forest investments near to home. The business opportunity is to market this more, and it would increase exponentially if this was part of a compliance market.
- Blue carbon – develop methodologies and markets for carbon sequestered in saltmarshes and seagrasses.
- Soil carbon and agricultural management practices; farmers selling credits from retaining soil carbon above their existing management obligations under existing incentive schemes.

#### ***Other offsets***

- Nutrient neutral – some kind of cap and trade – minimising nutrient input on farms to extent possible but where certain level of nutrients needed, offsetting elsewhere. Need a very local implementation. (This might be regarded as PES)

### **3. PAYMENT FOR ECOSYSTEM SERVICES**

#### **Morning break-out notes**

- Stacked or bundled PES for water catchment management could deliver water quality and quantity and flood control. Could sell different services to different clients, for example

water companies might pay for water quality and quantity, insurers might pay for flood control, conservation NGOs might pay for biodiversity benefits of environmentally friendly water catchment management.

- Given the low price of carbon, we need to think about the ‘+’ in REDD+, i.e. pricing and selling the other ecosystem services provided by forests.
- We need metrics for measuring ecosystem services for the purposes of PES.
- While some progress has made internationally with carbon, this is limited and unwinding; the voluntary carbon market although small is growing in the absence of an international carbon market
- A general issue with PES is who are the buyers? Linked to this is the question of how do we create demand for services?
- How do we ensure the permanence of ecosystem service benefits derived through PES?
- We need to validate the science underpinning PES and ensure that buyers are being delivered the requisite services
- Barriers to PES include the fact that the EU Emissions Trading System (ETS) does not include carbon offsets.
- The concept of ‘Allowable Solutions’ in relation to mitigating residual carbon emissions (that cannot be addressed on site) associated with new homes provides a potential PES opportunity.
- Zero carbon building regulations – retrofitting building stock could have an allowable solutions component.
- Knowledge and experience of PES could contribute to the ecosystem knowledge economy
- What is the cost associated with not pursuing PES? We need to count the costs of not selling ecosystem services
- Business needs reassurance re the certainty of future payments
- What role of benchmarking PES schemes?
- Is there a role for regulation re setting standards re transactions?
- Is there a role for common units of account or would this lead to over-simplification?
- Is there a possibility that regulation could ‘eat into the PES opportunity? Is there a possibility that regulation might be more cost-effective than PES? Is PES more applicable in developing countries?
- We need to move ‘soft’ CSR investment to formal markets
- As a country, we are not unfamiliar with locking land into long-term agreements as required through PES (e.g. it is difficult to ‘de-designate’ SSSIs)
- For the purposes of PES, should we target non-food productive land?
- ‘Layering for viability’ (i.e. selling multiple services from the same parcel of land to different buyers) may be possible but will drive up transaction costs

- We need to establish the significance of upland water services and understand the economics of upland areas
- What is the potential role of Government in aggregating buyers and establishing intermediaries?
- Is there a distinction between payments for capital investment vs. payments for ecosystem flow?
- Government is developing guidance on water, carbon PES
- Companies need to better understand their impact on ecosystems and ecosystem services – may be a need for sectoral approaches
- Could use agri-environment schemes to pilot different PES approaches
- Science for measuring ecosystem services is weak – too much guess-work – need to develop proxies, e.g. per hectare approaches
- In many situations, there are multiple actors – and may be free-riders who let others pay – how to manage this?
- Pollination services – the relative benefits of ecosystem management for wild pollinators was stressed, compared to buying in pollination through bee hives

### **Afternoon break-out notes**

Long-list of PES opportunities:

- Carbon PES and 'Allowable Solutions'
- Peatland Carbon Code
- 'Layered' PES generally
- Catchment trust funds
- Conservation credits
- Visitor pay-back schemes
- Aggregate potential bidders and encourage applications to pots of money
- Responsibility for addressing flood risk changing and opportunities for PES schemes could emerge (community funding match funded by Government?)
- Water storage PES
- Further development of the Woodland Carbon Code (e.g. to encompass biodiversity)
- Building biodiversity into PES schemes (e.g. potentially higher prices for 'charismatic carbon')
- Land Carbon Code (NB would need to include agricultural land)
- Localised PES (e.g. PES schemes for housing developments whereby residents pay a levy for nature reserve management); relevant examples include the levy that Merton Council collects for properties within a three quarter-mile radius of Wimbledon Common which is

passed onto the Wimbledon and Putney Commons Conservators (WPCC), for the upkeep of the Common.

Other related opportunities for facilitating the emergence of PES schemes:

- Establishing baselines for PES schemes
- Developing / identifying / capacity building 'catchment guardians'

Short list / enabling actions

- Promoting water-based PES and building in other benefits
- Promoting baseline data availability (e.g. from Environmental Impact Assessments, National Forest Inventory, Countryside Survey) including ease of access
- Developing PES guidance and toolkits
- Exploring the links between water company activities and the interests of the insurance industry together with the role of Ofwat
- Integrating ecosystem services within Cost-Benefit Analysis (CBA)
- Undertake formal evaluations of projects employing the ecosystems approach and looking at their relative cost-effectiveness
- Make firm recommendations re 'Allowable Solutions' and carbon PES
- Make links between property values and amenity value as discussed in the NEA

Potential enabling actions for developing a hypothetical catchment trust fund (NB in no particular order)

- Establish consensus on appropriate land management techniques
- Map ecosystem services
- Identify problems (top-down to a degree) and engage with stakeholders (bottom-up approach)
- 'Apportion' services arising from a given intervention to different buyers
- Follow a 'vision – plan – fund' approach
- Identify catalyst for the scheme (could be a person) (funding potentially required)
- Establish appropriate governance structure (who makes the ultimate decisions?); include innovations such as a rural sounding board?
- Learn from experience (e.g. Scotland's experience with 'rural priorities' and Welsh agri-environment scheme vis-à-vis targeting)
- Marry public (agri-environment) and private (user-financed PES) finance
- Provide sufficient resources to facilitate funding applications (e.g. Heritage Lottery funding not entirely spent)
- Provide funding for co-ordinators / facilitators / brokers / catchment managers
- Use a 'place based approach' for potential urban PES schemes

## 4. ENVIRONMENTAL TECHNOLOGIES

### Morning break-out notes

- Streamline planning consents for use of environmental technology, for example water companies using floating solar panels on reservoirs, bio-bullets and other technologies to combat invasive alien species such as zebra mussels.
- Ensure access to finance for solutions in particular areas of environmental technology and train venture capital and private equity staff to understand and specialise in opportunities for environmental technologies related to biodiversity and ecosystem services.
- Use consultants/researchers to find business opportunities from changing business processes and/or payment and incentive systems. For example, the US du Pont plant that almost exclusively manufactured paint for a Ford car factory - seeking to reduce environmental impact, du Pont worked with the paint company to change their supplier contract, to be paid per car painted not per tin of paint, and trained Ford in car-painting. Paint volumes were reduced by half: environmental impact was halved and profitability doubled.
- Use valuation methods to understand from where in the value chain risks and opportunities from impacts and dependence on biodiversity and ecosystem services arise - then address priority areas. (See Puma: <http://safe.puma.com/us/en/2011/05/puma-announces-results-of-unprecedented-environmental-profit-loss/>)
- Waste treatment: Lancaster County Council reduced payments on landfill tax by treating waste. They removed and incinerated methane, then treated the waste and used it to apply to land and plant trees on. Reduction and reuse of waste energy was linked to creation of woodland thanks to an innovative person on the council.
- Business opportunities from generating and manipulating digital technologies related to biodiversity and ecosystems for business (whether spatial planning or screening/diagnostics, etc).
- Monitoring / traceability is a big opportunity (e.g. biometric tagging)
- Remote sensing and data interpretation ('ground truthing') is also an opportunity.
- Spin-offs from NERC and other public bodies are a possibility
- Technology can help facilitate people engaging with nature
- Water and other resource scarcity could drive technologies to help reduce volatility in markets
- Prices and value of nature should determine technological choices but metrics are a problem – how to value the protective services of a salt-marsh? Need to combine technology with nature's services.

### Afternoon break-out notes

- The availability of information (e.g. data on biodiversity, ecosystem state, materials, water etc) was identified as crucial for the successful application of environmental technologies

generates opportunities for UK businesses that value and protect nature's services. Such information services can be a business opportunity themselves.

- Businesses need to understand the benefits that these information technologies can deliver. For example, how would businesses benefit from such information? How can this information be provided? What systems are required to provide it and utilise it? What form shall it take? Visualisation provides additional opportunities for communication.
- The two opportunities discussed under environmental technologies were confirmed as good examples of ways for businesses to create opportunities that are profitable but at the same time value and protect nature's services.
- However, the size of the business and the level of investment required for the use of such technologies were seen as critical parameters for their application. There is some concern that innovative and sustainable applications such as water reuse and material management are more likely to be adopted by large companies that can clearly realise the benefits (as is currently the case) and less so by SMEs. However, SMEs were identified as good cases when risk-taking enables the transition even if the benefits are not yet apparent.
- If developers had ecosystem related information upfront, they could take more profitable precautionary action than waiting to incur damages and pay for the clean-up and possible penalties (e.g. avoidance of regulatory implications arising from Habitats Directive etc.).
- Another enabling factor for this was the size of the market as an indication of the potential to reduce costs or increase profits associated with the application of new technologies.
- One-size fits all may be difficult. Information is needed to identify business specific opportunities and trade-offs. This is relevant to business models of different sectors and localities, both critical parameters that will vary the potential of this approach.
- An alternative mechanism to evaluate the benefits of ecosystem services delivered from the application of environmental technologies relates to interdependencies within a system as a way of calculating the value of a product or service based on the presence of a demand or usage in the proximity.

Additional Environmental Technologies Business Opportunities (most popular are underlined)

- Development of technologies for measurement & assessment
- (Urban) green infrastructure. The development of such infrastructure should not just constitute a fashion but a means of truly delivering ecosystem services
- Low impact protein production (in the past has taken the form of medieval fishponds).
- Smart cities that would feature closed-loop systems, low impact protein production etc.
- Biotechnology (breeding, genetic markets, etc).
- Distributed production (e.g. of drinking water).
- Opportunities for leasing services (shifting from a product to a service focus).
- Improved household appliances (e.g. smart fridge)

- Gaming ecosystem technology as an opportunity for business?
- Business opportunities from generating and manipulating digital technologies related to biodiversity and ecosystems for business (whether spatial planning or screening/diagnostics etc).

#### Enabling actions for environmental technologies

- Availability of technology/innovation
- The cost of alternatives, i.e. environmental resources undervalued.
- Putting appropriate business models in place to properly internalise environmental costs and account for ecosystems services benefits. Only the calculation of these will justify the application of environmental technologies that are normally prohibitively expensive.
- There is a need for data/information services, and the management of information on ecosystem state and the opportunity for exchanging such information.
- Facts and figures are needed to make a business case for environmental technology opportunities (potential of cloud computing).
- Public perception and a change in mindsets need to facilitate such opportunities (e.g. valuing waste as a resource).
- Companies could help customers make sustainable choices.
- Streamline planning consents as an incentive for use of environmental technology (e.g. water companies using floating solar panels on reservoirs)
- Ensure access to finance for development and launch of environmental technology
- Change business processes and/or payment and incentive systems, e.g. payment for provision of outcomes (e.g. final products) not volumes of raw material.
- Use valuation methods to understand where in the value chain risks and opportunities from impacts and dependence on biodiversity and ecosystem services stem, and then address the priority areas.

## 5. MARKETS FOR CULTURAL SERVICES

### Morning break-out notes

- Most likely to be sold as part of multiple benefits from urban or urban-edge green space, for example Green Health Prescriptions to use city parks for physical + mental
- Health – GPs could prescribe green treatments – landowners could lease access to nature to local health authorities, creating a market
- Educational services: schools; business leadership programmes
- Nature is a factor in workforce locations re: housing market and business location
- Markets for cultural services are dominated by micro-businesses (e.g. B+B/ accommodation market – so needs simple solutions)

- Urban-edge provision of green space for cultural services such as recreation, e.g. auction of micro-landscape features to local community (in Holland)
- Proposition: branding of built + natural infrastructure (supported by CAP/ ELS agreements - linked to local knowledge)
- Charge for access to national parks and other green spaces and invest the income into ecosystem conservation. Explore the possibility of a consortium of neighbouring farmers collaborating to invest in conservation and open their farms for a fee for leisure and recreation.
- Already developed in many areas – but tourism industry not well aware of ecosystem services – should tourism sector pay for landscapes?
- Need education to change mindsets/behaviour
- In developing informed consumers, we need to consider the role of advertising agencies
- May be cultural reactions against putting English nature on the market – cf reaction to Defra’s plans to privatise woodlands/forests

### **Afternoon break-out notes**

Long list of candidate areas, themes and headings included the following:

- Improved public health through exposure to green spaces and nature.
- Nature as a core asset for tourism.
- Restoration of urban green spaces to provide health, quality of life, flood protection, biodiversity and regeneration benefits. For example through restoration of urban of riparian environments by creating streamside walkways and cycle paths (that also cut traffic congestion and improve health).
- Education in natural environments, thereby providing benefits in enabling society to make transitions to greener living based on more exposure to Nature.
- Improved public participation and building social and community capital through the enhancement of green spaces.
- Place-based product marketing, for example of food grown for local markets in culturally resonant landscape, such as cattle reared on a city common.
- Technology and reaching Nature with for example smartphone apps. Also major export opportunity for the UK arising from natural history film-making.
- Building market in outdoor equipment, from fishing tackle to binoculars.

Priority areas for action – with suggestions on how to pursue them:

- Improved public health. Health outcomes can improve through exposure to Nature. This fact could underpin a new growth industry that achieves value for money outcomes compared to drug-based treatments, for example through woodlands and other habitats being managed for health purposes, with for example wardens and health and safety standards in place. The NHS might be a purchaser of such services.

- Enabling action: A health and Nature summit could identify how business opportunities could be developed. The development of common data sets could help health and Nature professionals use the same body of evidence, or at least comparable numbers, in how they set their priorities and choose their tools.
- Green infrastructure in the built environment. Designing green spaces and water into built environments increases the market value of properties. The social benefits that come with urban Nature areas are of most value to poorer people, thereby helping achieve social equality and cohesion.
  - Enabling action. The planning system could join up of health, social, environmental and economic outcomes. Sustainable Urban Drainage Schemes could be used to create urban green areas. In order to justify the costs of such actions the industry regulator could set out metrics that enable the health and other benefits of enhanced green spaces to be calculated by companies.
- Tourism. This key sector is in large part based on Nature.
  - Enabling action. Assess the value of nature to tourism to shape policy choices.

## 6. FINANCIAL AND LEGAL SERVICES

### Morning and afternoon break-out notes combined

- Role of credit rating agencies – for example including ecosystem management in rating countries or companies – taking a long term rather than a short term perspective.
- Opportunities for insurance – particularly taking account of floods and natural hazards - e.g. New Orleans demonstrates that there is often insufficient investment in ecosystems and ecosystem services due to a failure to fully account for risks.
- Environmental bonds: Create bonds underpinned by government. Even if low rate of return, could be a secure way of diversifying investment. Good but relatively simple metrics for the conservation delivery would be needed to contribute to the rating that impact investors would want.
- Green Investment Bank to look into funding EMTF opportunities other than renewable resources, e.g. look into green asset classes like bonds.
- Financial product based on the Principles for Responsible Investment. Financial institutions subscribing to the PRI will be looking for some asset classes that show investment in sustainable development.
- Fund for support for SMEs to get new BES-friendly innovations to market (the system is much better in Germany, given interventions and investments by central, regional and local government. Most SMEs in the UK struggle even to find funding to exhibit at buyer events.)
- Need to cope with free-riders
- Re-insurance – could deliver impact at scale
- Need to move from green markets in financial system to main markets

- Many supporting actions from within these sectors (e.g. appropriate legal form for long term offsets agreements)
- Missed some things (e.g. bonds, insurance against ecosystem outcomes).
- Performance indices – an opportunity to design these better and prove their worth by sharing how they help companies perform better over time. Performance indices are very inadequate at present. **Good area of R&D** for financial services sector: Identifying and quantifying risks – financial instruments to manage environment better. An opportunity? But more motivating to realise investments perform better if take these measures (rather than phrase in terms of 'risk'. Resilience also important; if companies can show more resilience to change through reducing environmental impact. Insurance – need data/research and training to keep evaluating risk.

## 7. ECOSYSTEMS KNOWLEDGE ECONOMY

### Morning and afternoon break-out notes combined

- Strong influence of regulatory structure
- Multi- disciplinary ecosystems-based course content
- Add ecosystem knowledge: business services/wider business education – e.g. understand risk
- UKNEA export opportunities
- Data: underpins market potential; links to communications tech. – e.g. nature reserves apps
- Knowledge for habitat creation
- Study to look at changes in patterns of work (e.g. home-working and local employment) to avoid energy and ecosystem impacts of commuting.
- Opportunity for different utility companies to work together to create new business opportunities, e.g. water and gas companies have room for collaboration, because if customers use less water, then they use less gas. There are market opportunities (of packaged benefits for customers) arising from that.
- Too much imprecision of those latching onto potential work in this field. There's a general stampede of consultants wanting to offer valuation services etc without the specific business opportunities/risks being clear. Nor a way to tell which tool is best.
- Who has the knowledge, where is the value?
- Share tools, expertise, knowledge with the right audiences
- Build UK ability to provide international knowledge services

## 8. CORPORATE ECOSYSTEMS INITIATIVES

### Morning and afternoon break-out notes combined

- Not so much an issue for EMTF?

- CR, reputation management with respect to environment still largely an add-on – needs to shift to core business
- Remove ‘reputational benefits...’ from the long-list; lots of work done on this already and not a core issue for business.
- Need to close gaps between sustainability directors and rest of business: reporting/ standards, etc. requirements could change this – for example when need to account for embedded carbon/water/energy in products. *EMTF: look at whether reporting requirements will drive action on ES.*

## **9. OTHER – Government incentives and disincentives - ecotaxes, levies, subsidies, grants, public procurement, planning, etc.**

### **Morning and afternoon break-out notes combined**

- NPPF leaves too much uncertainty for developers in terms of their obligations with respect to biodiversity and ecosystem services. There are screams for certainty on the part of business. Need unambiguous and clear policy framework.
- Need reform of the planning system to be based around ecosystem and ecosystem services delivery. The benefits would outweigh any modest extra costs.
- The role of signals from Government (e.g. in relation to solar)
- Don't be scared of making recommendations on taxation.
- The role of the City; how can we present/engage with a City audience? In particular, how can we engage with investors including pension funds? Data is key to City engagement.
- Ecosystem market opportunities at the city level: Birmingham City Council has an initiative to promote a city level approach to climate adaptation. This involves actions across 8 business sectors and the public sector. WBCSD has been involved, and 20 companies have been engaged and are exploring business opportunities at the city level. Strong links have been developed with academic institutions in the city. Opportunities are being explored in the field of public health and in conjunction with the Green Deal. The example demonstrates that ecosystem market opportunities can be explored at different geographic levels. The categories of business opportunity identified by the current study are broadly relevant to this initiative.
- Review the carbon reduction commitment; this has lost its recycling element, now just a straightforward tax. We could replicate the landfill tax but on carbon. Apply to Treasury – money from landfill tax – claim it back. Something using carbon abatement projects similar to landfill tax but on carbon.
- What about the role of ecosystem services in Government projects/procurement? Incentivise public procurement process so goods and services respect BES. (Right now, despite the sustainable development strategy of government, local authorities routinely use lowest cost suppliers, and are not rewarded for sourcing responsibly for biodiversity and ecosystem services.)
- Identify good private-public partnerships models for long term investment in ecosystem services. For example: When a ‘green suburb’ was being developed in Victoria, Australia,

the Victorian government made a statutory commitment to halve the approval period for companies which offered specified ecosystem services benefits after an open competition.

- A number of opportunities with blended revenue streams: If not get the rate of return needed privately, could nonetheless be viable because can reduce major costs for government if ecosystem outcomes delivered largely by private sector but with public-private partnerships and some public investment. E.g. Victoria, Australia – government achieved forestry policy by partnering with Pension Funds that couldn't have had an attractive rate of return with private funding alone. Such approaches could have a number of applications – e.g. dealing with flood risk.
- Remove perverse incentives
- Solutions such as the 'Green Deal' approach – carbon reduction could be applied to other ecosystems and ES issues.
- More sustainable procurement – use public procurement to ensure more sustainable products brought into the market. ISO standard could help here, providing a standardised way of putting ecosystem service conditions in contracts.



## **ANNEX 3 – REFERENCES IN UK NEA OF RELEVANCE TO BUSINESS AND MARKET OPPORTUNITIES**

The following tables provide a detailed analysis of the National Ecosystem Assessment, identifying references within the NEA that have relevance to business and market opportunities. In each case the tables provide the reference to the relevant section of the NEA and a short summary of the evidence presented in it.



### NEA Chapter 3: Drivers of Change in UK Ecosystems and Ecosystem Services

<b>What business activities/ practices have driven changes in ecosystems (positive and negative)?</b>	
3.2	Distinguishes between indirect drivers of change (demographic change, economic growth etc.) and direct drivers (habitat change, pollution etc)
3.2, 3.3.3.2	Agricultural conversion and intensification to increase food production have resulted in loss of biodiversity
3.2, 3.3.3.2	More recent agricultural extensification through agri-environment schemes has benefited biodiversity and ecosystems
3.2	Energy production has polluted air and water impacting on ecosystems
3.3	Food demand affects farming practices
3.3.1.4	House building driving land use change and resource consumption and damaging ecosystems
3.3.2.1, 3.3.3.2	Low profitability of UK timber has led to increased management of forestry for conservation and amenity
3.3.2.1	Fisheries - market forces have driven unsustainable catches for direct consumption, aquaculture feed and fertiliser
3.3.2.3	Globalisation has led to increased scale of farm production, simplified landscapes and loss of cultural values
3.3.3.1	Renewables growth impacts on land use decisions
3.3.5.1	Technological change in farming and fishing including mechanisation and chemical use
3.3.5.1	Technological advances in environmental monitoring
3.4.1.5	Habitat change (agriculture, forestry, minerals, marine industries, urbanisation, infrastructure)
3.4.2	Pollution (air and water)
3.4.3	Resource use (fisheries, timber, livestock, water abstraction)
<b>Which business sectors are identified as driving changes in ecosystems (positive and negative)?</b>	
3.2	Agriculture (land use and management), energy (air and water pollution)
3.3	Food demand affects farming practices
3.3.1.4	Housing construction (land use change affecting provisioning, regulating and supporting services)
3.3.2.1	Forestry (conservation and amenity)
3.3.2.1	Fisheries (unsustainable harvests)
3.3.4.2	Media - role in enhancing awareness and driving change
3.3.5	Agriculture and fishing - technological developments
3.3.5	Agro-chemicals
3.3.2.1	Aquaculture (fish harvesting for feed)
3.3.2.1	Fertiliser production (fisheries catches)
3.3.3.1	Renewable energy (land use)
3.3.5.2	Biotechnology (effects on land use and management e.g. GM crops)
3.3.5.3	Energy (biomass impacts on biodiversity and ecosystems)
3.3.5.4	Transport (spread of IAS, pollution, land use change for infrastructure)
3.4.1.1	Agriculture (land use change)
3.4.1.2	Forestry (land use change)
3.4.1.3	Tourism (impacts on coastal habitats)
3.4.1.3	Industry (impacts on coastal habitats)

3.4.1.3	Fisheries (impacts on marine habitats)
3.4.1.3	Energy (impacts on marine habitats)
3.4.1.4	Minerals/aggregates /peat (habitat conversion, degradation, fragmentation)
3.4.1.6	Water (ecosystem processes, land use change)
3.4.1.6	Transport (land use change)
3.4.1.6	Construction (land use change, ecosystem processes e.g. through flood defences)
3.4.1.6	Energy (land use change, ecosystem processes)
3.4.2.1	Transport (air pollution)
3.4.2.1	Agriculture (air pollution)
3.4.2.2	Agriculture (water pollution)
3.4.2.2	Water (pollution of marine environment)
3.4.3.1	Fisheries (resource exploitation)
3.4.3.2	Timber (resource management)
3.4.3.3	Agriculture (grazing pressure)
3.4.4.4	Water (pressure on environment due to abstraction)
<b>Are any solutions to these pressures identified that are relevant to business?</b>	
3.3.1.4	Building on brownfield sites
3.3.2.1	Increased demand for organic food influencing land management practices
3.3.3.1	Legislation, increased use of market instruments and emission trading
3.3.3.2	Changing subsidies and support structures for agriculture and forestry
Box 3.1	Voluntary agreement - Campaign for the Farmed Environment - to replace environmental benefits of set-aside
3.4.2	Environmental technology (reductions in air and water pollution)

#### **Chapter 4: Biodiversity in the Context of Ecosystem Services**

<b>What business activities/ practices have driven changes in biodiversity (positive and negative)?</b>	
4.6	range of land use changes - see below and Table 4.5
4.5.3	Conservation management is able to increase status of a number of threatened species
4.6	Point and diffuse pollution impacts
4.6	Marine exploitation, exploits target and non-target species
4.6	Climate change is driving change but outcome unknown
<b>Which business sectors are identified as driving changes in biodiversity (positive and negative)?</b>	
4.5.1	Commercial fishing
4.6	agricultural intensification
<b>Are any solutions to these pressures identified that are relevant to business?</b>	
4.2	Better knowledge of ES-BD links
4.6	Some recovery from pollution impacts have been observed
4.6	Need to improve targeting of response to land use change to specific biodiversity impacts (e.g. in agri-env schemes)
<b>Are any ecosystem services linked to biodiversity identified that provide direct opportunities for business?</b>	

4.2	Pollination research (e.g. LWEC) and services (4.4)
4.2	Resilience of services is positively related to BD
4.4	Multifunctional ecosystems are impact in biodiversity provision
4.5.2	Declines in lowland pools, semi-natural habitats
4.5.3	Higher species (e.g. birds) highly important to cultural services
4.6	land use change and pollution are major drivers of change
4.6	Responses to observed changes are successfully reversing BD loss

## Chapters 5 – 12: Broad Habitats

CH 5 Mountains, Moorlands and Heaths		CH 6 Semi Natural Grasslands		CH 7 Enclosed farmland	
<b>Which natural capital assets or ecosystem services are in long-term and/ or steep decline?</b>					
5.2.2.1	Loss of habitat area due to forestry and agricultural conversion	6.2.3.1, 6.2.5.1	In the past, extensive loss and degradation of semi-natural enclosed grassland due to conversion to arable land / intensification / agricultural improvement, especially in UK lowlands	7.2.1.1	Bioenergy crops increasing due to climate change, but from a very low baseline
5.2.2.1	Loss of lowland heath due to development, afforestation, agricultural improvement and abandonment	6.2.3.1, 6.2.5.1	Degradation of semi-natural grasslands in unenclosed uplands due to overgrazing / agricultural improvement / forestry	7.2.2.1	Climate change will affect other agricultural habitats
5.2.2.1	More recent reversal of loss of heather moorland	6.2.5	Losses have slowed over last decade due to improved protection, management, restoration and re-recreation	7.2.2	Specialisation and homogenisation due to mechanisation, markets and policies
5.2.2.2	Loss of habitat quality due to overgrazing, burning, N deposition	6.2.5	More recent declines due to nitrogen deposition, inadequate management and habitat degradation (rather than agricultural pressures).	7.2.1.2	Loss of hedgerows due to poor management but decline has decreased due to increased protection
5.2.2	Acidification of upland soils up until 1970s is being reversed	6.2.5.2	Continuing loss of acid grassland in the uplands due to forestry	7.2.1.3	Increase in farm woodlands
5.2.2	Climate change is affecting some species negatively and others positively	6.2.3	Recent gains due to creation, restoration as a result of agri-environment incentive measures	7.2.1.4	Declining number and quality of ponds due to drainage of land, infilling and pollution
5.3.1.5	Peat extraction impacts negatively on habitats			7.2	Some increasing diversification due to agri-environment and former set aside schemes
				7.2.1.1	Increase in neutral grasslands due either to agri-environment schemes or possibly due to neglect
				7.4	Declines in some ecosystem services such as air quality, water quality, erosion regulation, nutrient cycling, biodiversity conservation and landscape quality due to agricultural production

CH 5 Mountains, Moorlands and Heaths		CH 6 Semi Natural Grasslands		CH 7 Enclosed farmland	
				7.2.2.9	Increasing ecosystem services from improved / restored / created habitats following introduction of the agri-environment schemes
<b>Where have large irreversible changes to the UK's natural capital occurred?</b>					
5.2.2.1	Loss of lowland heath due to urbanisation	6.2	Losses of 90% in the UK lowlands since 1945 largely due to agricultural improvement	7.1.2	Significant loss of semi-natural grassland habitats due to agricultural improvement (see Chapter 6 summary)
<b>Which business sectors/activities are identified as driving changes in each habitat (positive and negative)?</b>					
5.1.3	Minerals (historic extraction)	6.2.5, Table 6.9	Agriculture - agricultural improvement, conversion to arable land. Esp. lowland and upland semi-natural grassland priority habitats. Less important driver currently and in the future	7.2.2	Agriculture - intensification, habitat change, pollution from fertiliser / pesticide use
5.2.1	Forestry (land use change in the uplands)	6.2.5.2, Table 6.9	Forestry - causing loss of acid grassland in the uplands. Moderate driver currently and in the future	7.2.2.1	Sectors / activities contributing to climate change - both in terms of the impacts of temperature / precipitation changes and sea level rising. May increase / decrease productivity, change spectrum of crops / diseases, etc.
5.2.1	Agriculture - grazing pressure in uplands and undergrazing of lowland heath	6.2.5.2, Table 6.9	Construction - infrastructure causing habitat destruction / fragmentation, minor driver currently and in the future.	7.2.2.7,	Research / development - species introduction / removal from the development of new crops, control of new pathogens, pest control, development of new technologies / machinery / techniques / agrochemicals.
5.2.1	Recreation - management of upland grouse moors (burning, predator control)	6.2.5.5, Table 6.9	Agriculture - overgrazing threatening upland acid grasslands, and existing acid grassland. Minor driver in the future		
5.2.1	Construction - urbanisation of lowland heath	6.2.5.3, Table 6.9	Industry - nitrogen deposition and transfer. Esp. for neutral and acid grasslands. Moderate / major driver currently, likely to be moderate driver in the future		
5.2.1.2	Energy - air pollution affecting uplands	6.2.5, Table 6.9	Agriculture - agri-environment schemes improving / increasing semi-natural grassland habitats		

CH 5 Mountains, Moorlands and Heaths		CH 6 Semi Natural Grasslands		CH 7 Enclosed farmland	
5.2.1.2	Transport - air pollution affecting uplands	6.2.5, Table 6.9	Energy - climate change, major driver in the future		
5.2.1.2	Agriculture - air pollution affecting uplands	6.2.5.4, Table 6.9	Agriculture - inadequate management, e.g. from under-grazing esp. in lowland priority semi-natural grasslands and calcareous and acid grasslands and purple moor-grass / rush pastures		
5.3.2.1	Renewable energy - effects on landscape and habitats	6.2.5.3, Table 6.9	Agriculture - indirect nutrient enrichment / runoff		
5.4	Tourism - damage to fragile ecosystems through disturbance, erosion, ski resort development etc				
<b>Which business sectors/activities benefit from the ecosystem services delivered by the habitat?</b>					
5.1.3	Tourism and recreation important in MMH areas	6.3.4	Agriculture - spillover of pollination / pest control services	7.3.1, Table 7.3	Agriculture / Hospitality / Catering - provisioning services especially food
5.1.3, 5.2.1	Field sports are important in MMH areas	6.3.6	Water - storing seasonal floodwaters, retaining silt, slowing drainage, flood protection, aquifer recharge	7.3.2	Agriculture - regulating services such as pollination / pest control, climate regulation, soil integrity, water quantity / quality, etc.
5.3.1	Agriculture - provisioning services - sheep and beef, wool	6.3.6, 6.3.7	Water / Agriculture - purification, reduced pollution and storage of pollutants in water and soil	7.2.2.3, Table 7.3, 7.3.4.3	Tourism - cultural / recreational benefits from agricultural landscape / characteristics
5.3.1	Food - from farming, game dealing, honey and other products	6.1	Coastal - coastal defence for sand dunes	7.3.2.2, Table 7.3	Water - hazard regulation, waste regulation. flood risk mitigation can be compromised by management, but important for catching ground / surface water (positive and negative impact)
5.3.1	Minerals - extraction of peat, minerals and coal	6.3.2	Tourism - recreational value, attraction of rare livestock breeds	7.3.1.3, Table 7.3	Energy - provision of bio-energy crops
5.3.1.7	Water - freshwater provision	6.3.1, 6.3.5	Agriculture - provisioning services: livestock production, food, fibre, enhanced quality of meat and milk, genetic resources	7.3.1.2	Tourism / Hunting - provision of wild game / recreational shooting
5.3.2.4, 5.3.2.5	Water - water purification and erosion control	6.3.2.4, 6.3.5	Knowledge / research: science of ecology and testing of ecological concepts	7.3.3.	Agriculture - supporting services such as soil formation, and nutrient cycling

CH 5 Mountains, Moorlands and Heaths		CH 6 Semi Natural Grasslands		CH 7 Enclosed farmland	
5.3.3.4	Tourism and recreation important in MMH areas				
5.3.3.6	Education				
5.3.1.4	Traditional lifestyle products - foods and materials based on natural products				
<b>Which options for sustainable management could create business opportunities?</b>					
5.2.1	Certification of forestry	6.3.4, 6.3.6, 6.3.7	Payments for ecosystem services - e.g. pollination / pest control / flooding prevention / water regulation	7.2.2.7, 7.2.2.8, 7.4.5	Certification / labelling e.g. of better farming management techniques (e.g. in dairy, use of integrated farming systems) or premium products (e.g. meat from grazing animals can be sold at a premium)
5.2.1	Carbon prices for forestry	6.3.2.4, 6.3.5	Research / knowledge exchange (e.g. UK ecological research reputation, rare livestock breeds providing dual benefits for conservation)	7.3.1.3	Bioenergy cropping - in certain conditions, depending on what / how the crops are grown, e.g. on poor quality farmland
5.2.2.3	Deer management - food and tourism	6.5.2	Biodiversity offsetting / habitat banking - option for restoring / creating more semi-natural grasslands	7.3.2.1, 7.5.2	Environmental technologies - e.g. more efficient resource use, developing low-carbon agriculture, adaptation to climate change impacts
5.5.3	Payments for ecosystem services	6.3.2, 6.5.6	Tourism, visitor payback schemes, marketing, education (e.g. rare birds, rare livestock breeds, etc.)	7.2.2.1, 7.2.2.7, 7.5.1	Research / development - e.g. better management techniques (e.g. precision technology) or inputs, development of alternative crops / varieties in response to climate change which also have other benefits (e.g. reduced nitrogen excretion, etc)
5.6.1	Increased need for scientific research and monitoring	6.3.1.2, 6.4	Labelling / certification of higher quality meat / milk products, or other premium products	7.5.1	Climate change adaptation activities e.g. diversification of crop types
Table 5.6	Tradable permits and carbon offset schemes	6.3.3.1, 6.5.5	Carbon storage, tradable permits and carbon offset schemes	7.1.1.1	Diversification of crop types e.g. flax / hemp for fibres, medicinal purposes, dyes, flavours, fragrances etc. which require less intensive inputs
Table 5.6	Rural business diversification including specialised local food, tourism	6.3.8, 6.5.4	Biomass cropping - could impact positively on many service and biodiversity if not intensively managed to	7.3.1.2, 7.3.4	Rural business diversification including specialised local food, tourism

CH 5 Mountains, Moorlands and Heaths		CH 6 Semi Natural Grasslands		CH 7 Enclosed farmland	
			increase production (but incompatible with grazing)		
Table 5.6	Biomass and carbon storage			7.2.1.3, 7.3.4, 7.3.4.3	Recreation - game shooting from farm woodlands
Table 5.6	Environmental technologies - moorland restoration techniques and technology			7.2.1.3	Farm woodlands being used to produce woodchips for wood fuel boilers
				7.5.4	Green infrastructure development and payments for ecosystem services - e.g. constructed wetlands
<b>Which business sectors are identified as benefiting from these options?</b>					
5.2.1	Forestry (certification, biomass, carbon markets, market prices)	6.3.1.2, 6.4	Agriculture (certification / labelling of premium products)	7.2.2.7, 7.5.1, 7.5.2, 7.5.3	Environmental technologies, research / development
5.5	Agriculture, tourism, energy	6.3.2, 6.5.6	Tourism	7.2.1.3	Energy - bioenergy crops, woodchip production
		6.3.2.4, 6.3.5	Research / knowledge exchange	7.2.2.7, 7.2.2.8, 7.5.3, 7.5.4	Agriculture - certification / labelling, diversification, new markets from premium products
		6.3, 6.5	Energy - biocrops	7.3.4.3	Tourism - recreation, bird watching, and game shooting
				7.5.4	Agriculture - green infrastructure development and payments for ecosystem services
				7.6, 7.6.1	Research / knowledge economy / knowledge exchange

CH8 Woodlands		CH 9 Freshwaters		CH10 Urban	
<b>Which natural capital assets or ecosystem services are in long-term and/ or steep decline?</b>					
8.1.1	UK lost most of its woodlands before 20th century. There has been expansion in the woodland area in recent decades, much of it focused on non-native commercial species, but a more recent trend towards expansion of broadleaved woodland 1998 to 2007	9.2.1.1	Areas in England under stress from water abstraction.	10.2.4	Domestic gardens are under threat with more paving, invasive species and demographic pressures
		9.3.3	England rivers worst performing SSIs	10.2.7	Allotments - declined
		9.3.6	Headwaters in Wales - number of taxa not comparable with elsewhere - as a result of diffuse pollutants	10.2.12.1	Many species have declined with increased urbanisation
		9.3.8	Urban rivers poorest water quality - including endocrine disruptors		
		9.3.8	Continued problems surrounding cultivated lands South and East of Humber line,.		
		9.3.11	Trends in eels cause for concern		
		9.3.13	Ponds - declining quality		
		9.3.19	Bird species dependent on wetlands have declined, increased rates in recent years		
		9.2.2.1	Extensive modifications to river channels for flood defence and land drainage damaged biodiversity		
		9.3.18	Lowland meadows and fens declined dramatically		
<b>Where have large irreversible changes to the UK's natural capital occurred?</b>					
8.2.1	Loss of ancient semi-natural woodland	9.3.2	Loss of multi spread rivers		
		9.3.6	Non-coal mines impact water quality		
		9.3.18	Lowland raised bog - 94% gone		
		9.3.18	90% wetlands lost since Roman time		
<b>Which business sectors/activities are identified as driving changes in each habitat (positive and negative)?</b>					

CH8 Woodlands		CH 9 Freshwaters		CH10 Urban	
8.1.3	Forestry - commercial afforestation has damaged other habitats	9.3.6	Welsh rivers - problems with sheep dip	10.2.13.3	Transport and heating systems have driven changes in air quality
8.1.3	energy - windfarm development puts pressure on woodlands	9.3.6	Cosmetic industry with nanoparticles		
8.1.3	Construction - loss of woodlands to urbanisation	9.4.2	Demand for peat for horticulture has driven change lowland bogs		
8.2.3	Forestry - management types including commercial and traditional practices	9.4.2	Change in direction of agriculture from less intensive to more environmentally minded		
8.2.4.1	Forestry - trends in planting and management of woodlands	9.4.3	Floor risk management now incorporates wildlife		
8.2.4.2	Agriculture - overgrazing of woodlands				
8.2.4.2	Construction - loss of woodlands to urbanisation				
8.2.4.2	Minerals - loss of woodland				
8.2.4.2	Forestry - unsympathetic management practices				
8.2.4.2	Recreation - inappropriate game management and recreational pressures				
8.2.4.3	Forestry - decline in traditional management practices				
8.2.4.4	Industry - air pollution				
8.2.5.1	Industry, energy and agriculture - climate change and air pollution				
8.2.5.3	Energy, transport, agriculture - effects on land use				
8.2.5.3	Forestry - technological development and mechanisation				
<b>Which business sectors/activities benefit from the ecosystem services delivered by the habitat?</b>					
8.2.5.3, 8.3.2.2, 8.3.4.1	Recreation and tourism including mountain biking, shooting	Table 9.1	Provisioning services provided by freshwater broad habitat include - fish, beef, reeds osiers, watercress, water, peat, navigation and heath products.	10.3.1	Community farms, allotments, beekeeping, timber, water dependent on provisioning services

CH8 Woodlands		CH 9 Freshwaters		CH10 Urban	
8.2.5.4	Agriculture - grazing pressure	Table 9.1	Many regulation services including flood regulation act across all businesses. But water industry particular reliant	10.3.2	Human health is hugely impacted by air quality.
8.3.2.1, 8.3.6.1	Forestry - trees for timber, fibre and fuel	Table 9.1	Tourism reliant on services.	10.3.7	Gardeners require pollination
8.3.2.2	Food - NTFPs and agricultural grazing/shelter	9.2.1.1	Direct use of water - agricultural irrigation and domestic water supply.	10.3.3.1	Green space in urban areas key to physical and mental health
8.3.2.2	Other uses of forest products - lichens for dyes and foliage for floristry	9.2.1.1	Whisky industry relies on water	10.3.3.3	Tourism sites are often surrounded by green space which supports tourism
8.3.2.3	Genetic resources - limited in UK	9.2.1.2	Hydropower generation - 2% national output impacts flow regimes	10.3.3.5	Education benefits from access to outdoor space
		9.2.1.3	Commercial and recreational wild salmon fishery		
		9.2.1.3	Recruitment for other fisheries		
		9.2.1.3	Floodplains support seasonable grazing (dairy, sheep, beef) and arable production		
		9.2.1.3	Habitat for wild game		
		9.2.1.4	Floodplains produce timber - willow		
		9.2.1.5	Reed beds provide reeds for thatching		
		9.2.2.2	General carbon storage benefits		
		9.2.2.4	Water companies cost dependent on sediment load		
		9.2.4.2	Coarse fisheries		
		9.2.4.2	Wildlife tourism		
<b>Which options for sustainable management could create business opportunities?</b>					
8.2.4.3	Deer management	9.2.2.1	Storage of floodwater on floodplains	10.5.2	Using previous impermeable land (roundabouts, urban roofs) for gardening, horticulture

CH8 Woodlands		CH 9 Freshwaters		CH10 Urban	
8.2.4.4, 8.2.5.4	Control of pests and diseases affecting woodland health, including invasive alien species	9.6	Integrated upstream thinking	10.5.2	Tree planting and additional green space creates flood storage
8.2.5.3, 8.3.3.1, 8.3.6.2	Carbon markets	9.6	Linking land and water management - Water Companies paying for it to reduce operational costs		
8.3.3.3	Purification of soil, air, water and mitigation of noise pollution				
Box 8.3	Creation of NHS forest				
8.4.2.2	Reinstating coppicing, traditional practices and skills				
8.5	Sustainable management and certification				
8.5.6	PES schemes may encourage sustainable management and ES delivery				
<b>Which business sectors are identified as benefiting from these options?</b>					
8.5	Forestry - through sustainable forestry schemes			10.5.4	Developers can landscape more naturalistically which has low management costs

CH11 Coastal margins		CH12 Marine	
<b>Which natural capital assets or ecosystem services are in long-term and/ or steep decline?</b>			
11.2.1	Sediment supply has reduced significantly	12.2.4	Shallow and sub-tidal sediments have been impacted by mobile fishing gear
11.2.8.1	UK lost 30% of sand dunes since 1900	12.2.7	Demersal fish severely depleted in comparison to 100 years ago, fish are also smaller.
11.2.8.4	Undisturbed areas of shingle have declined dramatically over time#	12.2.10.1	Many species of sea bird have fallen dramatically
11.2.8.6	Coastal lagoons declined markedly in 1980s	12.3.1.1	There have been significant declines in landings of demersal and pelagic fish
11.5.4	Areas of saltmarsh are declining		
<b>Where have large irreversible changes to the UK's natural capital occurred?</b>			
11.2.8.6	30-40% coastal lagoons lost during 1980s	12.2.2	Salt marshes and mudflats seen considerable loss

CH11 Coastal margins		CH12 Marine	
<b>Which business sectors/activities are identified as driving changes in each habitat (positive and negative)?</b>			
11.2.5	Tourism - can cause problems for habitats from increased resource use	12.2.7	Fishing is the biggest driver of change on fish stocks and has also been associated with fall in sea bird numbers
11.2.6	Agricultural and industrial expansion most common pressure on salt marsh	12.2.11	Aggregate extraction has a negative impact
11.2.6	Housing and tourism infrastructure most common pressure on sand dunes and shingle	12.2.11	Offshore wind farms
11.2.8.1	Sand dune loss driven by - caravan parks, industry, residential, golf courses,	12.2.11	Coastal and port developments
11.2.8.4	Shingle loss due to - housing, gravel extraction, caravan sites and new marina	12.3.1.1	Aquaculture can have a significant detrimental impact on the marine environment
11.2.8.5	Sea cliffs affected by - cultivation practices, over and under grazing, abandonment, urbanisation, walking, horse riding, air pollution, sea defences, erosion, non-native species	12.3.2.1	Ship's anti-foulant can cause problems for marine organisms living in the vicinity of ports, harbours and marinas
11.2.8.6	Lagoons have been affected by coastal defences, waterfront development and pollution		
<b>Which business sectors/activities benefit from the ecosystem services delivered by the habitat?</b>			
11.2.8.4	Gravel extraction dependent on shingle areas	12.3.1	Fish and shellfish fisheries (wild and aquaculture)
Table 11.3	Food provisioning	12.3.1	Fishmeal and fish oil for aquaculture and food supplements
Table 11.3	Military activities	12.3.1	Algae and seaweed as inputs for pharma and biofuels
Table 11.3	Tourism	12.3.1	Those businesses related to the fishing industry
11.3.2.1	Hazard regulation is hugely important	12.3.3	Educational opportunities with school trips
11.3.2.2-11.3.2.8	Climate, water quality, soil quality, waste breakdown and detox, pollination pest control and nursery grounds and noise regulation	12.3.3	Pharma companies invest in marine research
11.3.4.1	Huge cultural services provided by coast - many different activities	12.3.3.2	Recreational activities - bird watching ,angling
11.3.3.1	Tourism benefits		
<b>Which options for sustainable management could create business opportunities?</b>			
11.5.1.2	Managed realignment sand dunes - aggregate benefits outweigh costs	12.5.2	MPAs are potential for offsets
11.5.4	Managed realignment of saltmarsh can provide ES including flood defence and nursery areas for fish		
11.5.6	Targeted agri-environment schemes can move cliff tops away from arable		

CH11 Coastal margins		CH12 Marine	
	intensive areas		
<b>Which business sectors are identified as benefiting from these options?</b>			
		12.3.5.3	Blue biotechnology

## Chapters 13-16: Ecosystem Services

CH13. Supporting Services		CH14 Regulating services		CH15 Provisioning services		CH16. Cultural services	
<b>Which natural capital assets or ecosystem services are in long-term and/ or steep decline?</b>							
13.2.1	Loss of carbon from peat soils	14.3.1.1	Declining hazard regulation in coastal areas due to coastal erosion and declining functioning of coastal processes	15.2.2	In Wales area of cereal crops dropped significantly between 1940 and 2009, decline also occurred in Scotland	16.2.3.2	10000 parks and greenspaces sold in 80s and 90s, decline has been arrested though
13.2.2.1	Loss of soil carbon	14.3.1.1	Declining hazard regulation in uplands linked to hydrological change	15.2.2	The amount of bare fallow declined markedly in the latter half of the 20th Century.	16.2.3.4	26% of Landscapes were experiencing change that was inconsistent with landscape type
13.3.1.1	Nutrient cycling - N enrichment of terrestrial and aquatic habitats	14.3.1.2	Increasing rates of soil erosion	15.2.3	Of particular note is the reduction in the overall level of grasslands in the UK, and the apparent shift in grassland between rotational grassland (i.e. lasts less than five years) and cropland, and also some large declines in rough grazing that occurred in England, Scotland and Wales.	16.3.1.1	Cheap flights has resulted in people taking holidays abroad.
13.3.2.1	Air pollution impact on nutrient cycling	14.3.1.3	Increased rates of flooding due to decline in water regulation			16.3.1.2	As the numbers of different species has declined so has the opportunity to satisfy value needs.
		14.3.1.4	Increased risk of extreme events caused by climate change	15.2.2	Soft fruit orchards declined.	16.3.3.1,	Physical activity levels have dropped in the last generation linked to obesity creating huge cost for NHS - but link between environment physical activity not clear
		14.4.2	Declining pest and disease control	15.3.2	Landings of marine species fell from	16.3.4.1	Ethnic minorities often feel excluded from nature, environment and

CH13. Supporting Services		CH14 Regulating services		CH15 Provisioning services		CH16. Cultural services	
			linked to agricultural intensification		1948 - mainly demersal fish		heritage
		14.5.1	Decline in pollination linked to bee populations	15.5.4	Harvest of game birds declined cause unclear	Key findings	Interactions with nature are local and have urban characteristics
		14.6.1	Increase in noise pollution	15.5.3	Salmon and migratory trout catches fell		
		14.7.1	Changes in soil chemistry and organic matter	15.7.1	Timber (hardwood) harvests have fallen over past 40 years		
		14.8.1	Air pollution has declined but continues to affect ecosystems				
<b>What business activities/ practices have driven changes in the service (positive and negative)? (cross sectoral)</b>							
13.2.1	Air pollution - damage to peatlands	14.3.2.1	Coastal development affects coastal hazard regulation	15.2.3	Changes in rough grazing reduced grassland habitats	16.2.3.2	Policy initiatives have arrested decline in parks and green spaces - including legislation
13.2.2.1	Climate change - impact on soils	14.3.2.3	Urbanisation and interference with water system affects water regulating services	12.2.6		16.2.4.1	Laws protecting landscape and environment have changed relationship between humans and environment - increasing area of national parks
13.2.2.1	Urbanisation - impact on soils	14.6.2	Urban development impacts on noise	15.3.3	Declining stocks of fish have resulted in fewer catches- as a result of overfishing	16.3.2.6	There has been a growth in synergistic and pseudo synergistic satisfiers
13.3.2.3	Climate change - impact on nutrient cycling	14.7.2.3	Development - urban, industrial, energy - impact on soils	15.4.1	Falling fish stocks and demand for fish has meant that aquaculture has risen in output	Key findings	A driver of people's changing relationships with environmental settings has been associated with a desire for self-determination, responsibility and security (of self and environment)
13.4.2	Urbanisation - impact on water flows	14.7.2.3	Climate change and pollution - impact on soils	15.5.1	Afforestation and sheep numbers has reduced habitat for red grouse		
13.4.2.2	Climate change - impact on water flows	14.9.2	Air pollution - effects on water quality	15.6	Varroa destructor mite has impacted on honey production		
13.5.2	Climate change - impact on primary production			15.7.1	Softwood production increased largely due to forest stands		
13.5.2.2	N deposition and ozone pollution -			15.8	The whisky industry depends on Peat		

CH13. Supporting Services		CH14 Regulating services		CH15 Provisioning services		CH16. Cultural services	
	effects on primary productivity				and may have driven extraction, but now this has been recognised		
13.5.2.3	Climate change - effects on primary productivity			15.11.2	Rising populations drive demand for water but also leakage		
<b>Which business sectors are identified as driving changes in the service (positive and negative)?</b>							
13.2.1	Agriculture - soil erosion, damage to peatlands	Table 14.4	Agriculture, forestry, peat extraction, urbanisation, pollution affect climate regulating services	15.3.3	Fishing practices themselves drive change in fisheries		
13.2.1	Forestry - damage to peatlands - afforestation	14.3.2.2	Agriculture, recreation, tourism, forestry practices increasing soil erosion				
13.2.2.1	Agriculture - impacts on soils	14.3.2.3	Agriculture and energy sectors impact on water regulation				
13.2.2.3	Transport and construction - impact on soils	14.4.2	Agriculture - intensification encouraging spread of pests and disease				
13.3.2.1-13.3.2.2	Agriculture - impact on nutrient cycling	14.6.2	Transport - impacts on noise				
13.3.2.2	Water - impact on nutrient cycling through sewage sludge	14.7.2.1	Agriculture and forestry practices - impact on soils				
13.4.2	Agriculture - impact on water flows	14.7.2.2	Recreation and game management - impact on soils				
13.4.2	Water sector - impact on water flows	14.7.2.3	Horticulture and energy - peat extraction				
13.5.2.1	Agriculture - increase in primary production	14.8.1	Agriculture - atmospheric emissions				
		14.9.2	Water sector - effects of wastewater treatment on water quality				
		14.9.2	Agriculture - effects on water quality				
<b>Which business sectors/activities benefit from the ecosystem service?</b>							
13.2.3	Agriculture - dependent on soils	14.3.3.2	Water sector, agriculture and recreational fishing benefit from		All - provisioning services of relevance are captured by industry	16.3.4.4	Increasing voluntary and membership of the National Trust.

CH13. Supporting Services		CH14 Regulating services		CH15 Provisioning services		CH16. Cultural services	
			erosion control				One million members of the RSPB. Legacies have increased.
13.4.3	Agriculture - dependence on water resources	14.3.3.3	Property and hence insurance benefit from water regulation	15.2.2	Crops	16.3.5.2	Outdoor learning and ecological knowledge
13.4.3	Water sector - dependence on water resources	14.4.3	Agriculture, forestry, human health benefits of pest and disease control	15.2.3	Livestock	Key findings	Daily contact with nature is part of being human
		14.5.1	Agriculture benefits from pollination				
		14.7.3	Agriculture, water sector, flood management affected by declines in soil quality				
		14.9.3	Water sector - effects of water quality on treatment costs				
		14.9.3	Fisheries - effect of water quality				
13.5.3	Fisheries - influenced by primary productivity of marine system						
13.2.4	Sustainable management of soils - requires changes in agricultural management practices	Table 14.5	Sustainable management options in agriculture and forestry to improve climate regulation	15.5.4	Fixed nets across river nets are bought out. This could be a form of PES	16.3.3.1	Green exercise
13.3.4	Sustainable agriculture - role in enhancing nutrient cycling	14.3.4.1	Managed realignment, watercourse management and land management can help to prevent coastal hazards and flooding	15.6.1	Beekeeping contains opportunities for production		
13.5.4	Sustainable agriculture - how to maintain productivity of farming while preventing effects on water and marine systems	14.3.4.2	More extensive land management, sustainable agriculture and precision farming to prevent erosion	15.7.4	As embedded energy costs are taken into account wood products will begin to be more competitive in building construction		
		14.4.4	Agriculture - pest and disease management through new techniques and sustainable management practices	15.1	Conservation on the basis of genetic resources		
		14.5.4	Agri-environment schemes, enhanced knowledge and training relating to honey bees, to improve pollination services				

CH13. Supporting Services		CH14 Regulating services		CH15 Provisioning services		CH16. Cultural services	
		14.6.4	Role of vegetation and engineering solutions in noise management from transport				
		14.7.4	Improved soil management techniques in development, agriculture and forestry sectors				
		14.8.4	Tree planting/green infrastructure, sustainable agricultural management, water conservation - role in improving air quality				
		14.9.4	Sustainable agriculture - water quality				
		14.9.4	Wetland and watercourse management, Constructed wetlands - e.g. on farms - role in regulating water quality				
<b>Which business sectors are identified as benefiting from these options?</b>							
		14	Implications for agriculture, forestry, water sectors, construction (e.g. green infrastructure), environmental technologies (air pollution, soil management, pollinators etc)	15.5	PES schemes	16	Schools, local authorities (exercise)
				15.6.1	Apiarists		
				15	Development firms		
				15	Pharma companies		

## Chapters 17-20: Synthesis – Status and Changes in Ecosystems and their Services to Society in England, Northern Ireland, Scotland and Wales

CH17 England		CH18 Northern Ireland		CH19. Scotland		CH20. Wales	
<b>Are any specific linkages between business and drivers identified other than those identified in the above sections?</b>							
17.4.7.1	Coastal - impacts of recreational, urban, tourism developments, agriculture and forestry, aggregates, pollution from industry, transport, agriculture	Table 18.1	Summary of main drivers of change. Broadly similar to those at UK level.	19.4.1	Drainage of blanket peats for plantation forestry and land improvement	20.4.1.1	Sheep grazing which, in addition to its own impact in reducing vegetation cover and replacing heaths, woodland and mires with grassland, also exacerbates other impacts such as pollution and climate change.
Table 17.16	Summary of drivers affecting ecosystems in England - similar to those for UK as a whole			19.4.1	Over grazing and hill walkers can damage montane habitats	20.4.5.1	Highest altitude catchments in Wales (over 200 m) are afforested by exotic conifers that increase local sulphur and nitrogen deposition, thereby increasing the contribution of acids and metals.
				19.4.3	Agri environment schemes have contributed to avian and insect biodiversity	20.4.5.2	Welsh freshwater ecosystems are still suffering from an industrial legacy but there is evidence of improvement following remediation interventions, with over 50 metal mine locations having remediation strategies in place (Environment Agency 2002). The Afon Goch ('Red River'), which drains the currently inactive copper mine on Parys Mountain, Anglesey, has been described as one of the most acid- and metal-contaminated streams in the UK (Boult et al. 1994). Abandoned coal mines release acid, sulphate-rich water, often with negative effects on biota (Ormerod & Jüttner 2009).

CH17 England		CH18 Northern Ireland		CH19. Scotland		CH20. Wales	
				19.4.7	Aquaculture influencing heterotrophy microbial abundance	20.4.7.2	Major drivers of change in the Welsh Coastal Margin habitats include changing tourism patterns and interests, land use demands, as discussed above, climate change, nitrogen deposition and sea-level rise
				19.5.2.3	Agricultural intensification with more frequent use of broad spectrum herbicides has resulted in the decline of the traditional weeds at the base of the arable food web but an increase in other species, often crops Agricultural intensification with high densities and extensive areas of homogenous crop genotypes provides ideal conditions for both higher incidence of pests and diseases and their spread across the landscape	20.4.8.1	Bait digging limits the ability of cockles and mudflats and muddy gravel to recover.
				19.5.2.3	The survival and abundance of wild salmon and sea trout are reduced in areas with salmon farming, most probably by pathogens, parasites and diseases spreading from the farmed to the wild fish	20.4.8	Fishing has had a wide variety of impacts
				19.5.2.5	Windfarms are causing noise pollution		
<b>Are any specific linkages between business and habitats identified other than those identified in the above sections?</b>							
17.4.6.2	Urban - opportunities for green infrastructure	18.4	Limited evidence on business linkages, broadly similar to UK	19.4.1	Hill walking strongly linked to mountains moorland upland areas	20.5.2.1	Acidification could affect molluscs which would impact fisheries
				19.5.4.4	Water based recreation angling, canoeing, kayaking, nature viewing, jet skiing, water skiing, surfing and swimming	20.5.2.8	Large scale riparian schemes are underway

CH17 England		CH18 Northern Ireland		CH19. Scotland		CH20. Wales	
				19.5.4.4	Tourism and recreation large part of Scottish economy	20.5.3.7	The major reasons for water abstraction related to electricity supply and represented 75% of total Welsh abstractions.
<b>Are any specific linkages between business and ecosystem services identified other than those identified in the above sections?</b>							
17.4.1.2	Opportunities for development of peat alternatives for horticulture	18.5.2	Provisioning services and their value, including food, timber, renewables and biomass	15.5.2.4	Pollinators contribute a large amount to Scottish Agriculture		
17.4.1.2	Provisioning services - small scale use of natural fibre and food products from uplands	18.5.3	Regulating services, business linkages broadly similar to UK				
17.4.2.3	Grassland - recreational values	Table 18.16	Recreational, tourism and leisure values of natural environment				
17.4.3.3	Agriculture - valuation of environmental costs and benefits	18.5.4	Cultural services including tourism and recreational values				
17.4.4.1	Forestry - regeneration of former mining areas In National Forest	Table 18.17	Examples of the value of ecosystem services				
17.4.4.2	Forestry - wood fuel - Wood Fuel Strategy for England	Table 18.18	Estimates of the contribution of environment to NI economy - employment and GVA				
17.4.4.2	Forestry - non timber forest products						
17.4.4.3	Forestry - valuation of services						
17.4.5.1, 17.4.5.2	Freshwater - recreational fisheries, tourism						
17.4.5.2	Freshwater - development and construction - enhanced property values						
17.4.5.3	Freshwater - fisheries and recreational values						
17.4.7.3	Coastal - value of cultural services						
17.4.8.2	Marine - value of cultural and other services						
17.5.3	Provisioning services including food						

CH17 England		CH18 Northern Ireland		CH19. Scotland		CH20. Wales	
	(including wild food), fibre (e.g. thatching materials), energy crops, fresh water						
17.5.4.3	Urban green space and human health						
<b>What business opportunities are identified relating to sustainable management of ecosystems?</b>							
17.8	PES schemes	18.3.3	Costs of invasive alien species control - value of market opportunities	19.4.7	Potential for restoring oyster beds a highly desirable goal for coastal ecosystem management	20.5.2.2	Increased floodplain woodland and maintenance of grazing marshes can help protect against flooding
17.4.2.2	Opportunities for biomass from grasslands	18.8	Sustainable management opportunities including agri environment, woodland grants, planning, river basin management, designated sites etc	19.5.2.1	Appropriately managed semi-natural grasslands, woodlands peat soils are sources of climate regulation	20.5.4.1	Lakes rivers and seas are being targeted for expansion of water related recreation activities
		18.8.6	Certification of woodlands			20.5.4.1	Wildlife tourism is seen as potential source of expansion
						20.5.4.1	Part of the Valleys Regional Park project is focusing on maximising the economic opportunities offered by the environment for business through the ecosystem services approach.
						20.5.4.1	Walking is a key tourism activity in Wales (74% of all visitors felt it was an important part of a trip)
						20.10.1	Glastir (WAG 2010c), the new agri-environment scheme for Wales, provides farmers with financial incentives for appropriate soil management alongside other requirements for farm payments.
						20.10.3	Sustainable Drainage Systems (SuDS) is a more integrated approach to urban drainage and has been adopted as policy in Wales (Prosper 2002).

## Chapters 22-24: Human-Wellbeing

CH 22 Economic Values		CH23 Health Values		CH24 Shared Values	
<b>What market values are identified?</b>					
Table 22.27	UK fish landings: £596m p.a.		n/a		n/a
<b>What are the market values for different business sectors?</b>					
Table 22.27	Aquaculture: £350m p.a.				
Table 22.27	Venison: £24m p.a.				
Table 22.27	Legacy values for biodiversity: £90m p.a.				
Table 22.27	Timber production £96m p.a.				
Table 22.27	Water quality benefits of inland wetlands approximate total value up to £1.5 billion p.a				
Table 22.27	Climate change losses upon UK water availability are estimated at £350–490 million p.a.				
Table 22.27	Climate change induced increases in flooding costs range up to £23 billion p.a. depending upon strategy.				
Table 22.27	Marginal value of flood defence from wetlands = £407/ha p.a.				
Table 22.27	Fossil fuels currently meet 90% of UK energy demand. Market price £112 billion p.a. (of which £35 billion tax and duties).				
Table 22.27	Marine-based biotic raw materials = £95 million p.a.				
Table 22.27	UK aggregates industry worth £4.8 billion p.a. of which up to £114 million p.a. comes from the marine environment.				
Table 22.27	Amenity value of the climate £21 billion p.a. to £69 billion p.a.				
Table 22.27	Environmental knowledge embodied in higher qualifications valued at £2.1 billion p.a.. School trips to just 50 nature reserves valued at £1.3 million p.a.				
Table 22.27	Agricultural food production: £-50 to £75 per ha p.a.				

CH 22 Economic Values		CH23 Health Values		CH24 Shared Values	
22.3.7	possible increase in the annual river and coastal flood damage costs to property of £14–£19 bn by 2080				
<b>What further business opportunities are identified in relation to these markets?</b>					
Table 22.27	Water quality improvements would lead to some cost reductions in the costs of potable water supplies although commercial confidentiality means that the scale of these benefits is unclear				
Table 22.27	The costs associated with changing agricultural land use to reduce nutrient loadings into rivers are substantially smaller than the benefits which such changes would bring. However, the former costs are concentrated within rural communities				
22.3.1.1	Sustainable management of fish stocks to increase rents				
22.3.2.1	Maintaining genetic diversity of commercial species wild relatives				
22.3.2.1	Bioprospecting valuable species or compounds				
22.3.6.1	Lack of future water supplies - metering				
22.3.8.2	Avoiding water treatment costs				
22.3.8.2	Lower nutrient input farming				
	Adaptation of 1.34 million hectares of agricultural land at risk of flooding in England and Wales				
22.3.17.3	Adapting UK agricultural production to climate change				
<b>What non-market benefits are identified?</b>					
Table 22.27	Pollination services: £430m p.a.	23.1.1	Ecosystems provide a range of direct and indirect benefits to human health. They can both reduce (e.g. through reducing pollution) and create threats to human health (e.g. through pests, diseases)	24	Chapter covers shared values - i.e. joint values that communities place on ecosystems in addition to the aggregation of individual values
		Table 23.2	Health effects of different habitats		
<b>Which of these non-market benefits offer potential for market creation?</b>					
Table 22.27	Terrestrial biodiversity (non-use): £540m - 1,262m p.a.	23.4.4	Value of potential savings in healthcare costs from	24	n/a - collective values are not amenable

CH 22 Economic Values		CH23 Health Values		CH24 Shared Values	
			healthier lifestyles £2423 per person per year		to market creation
Table 22.27	Inland wetlands biodiversity (non-use): £273m p.a.				
Table 22.27	Coastal wetlands biodiversity (non-use): 1.275m p.a.				
Table 22.27	Marine Biodiversity (non-use): £1,714m p.a.				
Table 22.27	UK carbon emissions from coastal margins loss: £82m p.a.				
Table 22.27	Potential benefits of improvements to river water quality up to £1.1 billion p.a.				
Table 22.27	Marginal value of coastal flood protection by wetlands £2,498/ha p.a. Total value up to £1.5 billion p.a.				
Table 22.27	Amenity value of the climate £21 billion p.a. to £69 billion p.a.				
Table 22.27	Marginal amenity value of inland wetlands = £230/ha/yr; coastal wetlands = £1,400/ha p.a. Total wetland amenity value up to £1.3 billion p.a.				
Table 22.27	UK-wide valuations for agricultural greenhouse gas (GHG) emissions (i.e. costs) estimated for all of the UK ranging from £4,286 million p.a. in 2004 to £13,409 million p.a. in 2060 (both calculated using Stern values for the UKCIP high emissions scenario).				
Table 22.27	Within the above costs, emissions from peatlands are estimated at £130 million p.a. Total value of net carbon sequestered (i.e. benefits) annually by UK woodlands = £680 million				
Table 22.27	English recreation: direct expenditure of £20.4 billion p.a. (UK-wide values may exceed £30 billion p.a. In addition, foreign visitors spend £ in the UK).				
Table 22.27	Urban greenspace amenity: Valuations vary from losses of £1.9 billion p.a. to gains of £2.3 billion p.a. depending on policy scenario.				
<b>What business opportunities are there from market creation?</b>					
22.3.18.3	Changes to land-based carbon flows, including in agriculture (with increased emissions from uplands),	23.2.4	Green care - using natural environment as a framework to create health and wellbeing benefits for vulnerable		n/a

CH 22 Economic Values		CH23 Health Values		CH24 Shared Values	
	and changes in afforestation		groups		
22.3.20.1	Increase recreational amenity of visitor sites	23.2.4	Examples of green care - social and therapeutic horticulture, animal-assisted interventions, ecotherapy, green exercise therapies as a treatment option, nature/wilderness therapy and care farming		
		23.4.3	Wild foods venison (deer), rabbits and game becoming increasingly available and being purchased		
<b>What are the potential opportunities for different business sectors?</b>					
Table 22.27	Carbon storage in marine habitats potentially substantial but unquantified.	23	Healthcare, recreation, food sectors		
Table 22.27	Tentative assessments of health changes arising from a variety of contacts with nature provided, ranging from around £10/person p.a. for a marginal increase in woodland to around £300/person p.a. for views of greenspace from the person's home.				
22.3.14	Increments to house price values based on local environmental amenity				
22.3.15.4	Environmental knowledge embedded in educational outcomes/ value of school trips				
22.3.16	Understand environmental quality's influence on healthy behaviours				

## Chapters 25-26: Plausible Futures

CH 25. Scenarios		CH 26. Valuing Changes in Scenario Analysis	
<b>What are the implications of the scenarios on business pressures on biodiversity?</b>			
Notes are main variables across chapter, specific observations from Nature at Work (N@W) scenario	Fisheries, Agricultural land use change, Development (especially in SE and Coastal areas), Consumerism, GHG emissions and climate change, heterogeneity of land use and habitat fragmentation	26.4	CC increases intensity of upland land use, leading to biodiversity declines
		26.6	Potentially serious pressure on urban gardens
<b>What are the implications of the scenarios on business benefits from ecosystem services?</b>			
	uncertainty in intensity of provisioning services (timber and food), potential use of biofuels and woodfuel, understanding of overseas ecological footprint	26.2	Carbon sequestration in soils
		26.2	Carbon sequestration in vegetation
		26.5	visitor values from remote landscapes are sensitive to ecosystem management and socio-economic factors
<b>What are the implications of the scenarios for business opportunities?</b>			
	catchment management, multifunctional land and marine uses (e.g. N@W: multifunctional agriculture, organic farming, zero tillage; mixed plantation woodland), more UK recreational demand, Health-green gyms	26.2	land-use manipulations to store carbon in soils & vegetation
	N@W: biotech working with ES	26.6	Potentially serious pressure on urban gardens
		26.5	Attractive landscapes can be very high value, even if remote.
		26.5	Urban fringe recreation sites may increase in value
		26.5	Green space providing amenity close to homes may increase in value
		26.7	Recreational opportunities in multi-functional landscapes
<b>What are the implications of the scenarios for different business sectors?</b>			

CH 25. Scenarios		CH 26. Valuing Changes in Scenario Analysis	
	adapt to CC driven conflict between biodiversity and landscape goals, soil and vegetation carbon storage, erosion control through land use adjustment (e.g. no-tillage), shade provision (especially in high CC scenario), water services increase in value due to CC, Green space in urban areas for recreation and food (also N@W), Green roofs and urban tree (Species/design and implementation)	26.2	Agricultural land use change - possible large variations in gross farm income
	N@W: biotech for pathogen control, increases in timber, woodfuel, marine windfarms conserving habitats but shutting to fishing, biofuel increases, use of cc adapted vegetation species	26.3	range of changes to carbon emissions from changes to land use
		26.5	Recreational site pressures, e.g. in the south-west of the UK

## Chapter 27 – Response Options

<b>What responses are identified that affect business impacts on ecosystems?</b>	
27.2.3.2	Legislation - site designations and pollution control
27.3.3.2, 27.3.3.3	Legislative and policy responses to water pollution by agriculture and other sectors
27.4.3.2, 27.4.3.3	Legislation and policy promoting more sustainable agriculture
27.3.4.4	Role of advice to farming sector
27.5.3.2, 27.5.3.3	Policy and legislative drivers affecting forestry sector
27.5.3.5	Market creation in forestry - woodland grants, payments by energy companies for biomass, incentives provided by NGOs, tax incentives
27.6.3.2, 27.6.3.3	Legislative and policy developments driving fisheries sector
27.7.3.2, 27.7.3.3	legislative and policy developments affecting marine and coast, including sustainable economic development through better planning
27.8.3.2, 27.8.3.3	Legislative and policy developments affecting recreation and tourism sector, including role of planning and tourism businesses
27.9.3.2, 27.9.3.3	legislative and policy developments - urban planning, transport and energy - including planning developments, EIA, renewables policy, green infrastructure, transport planning
<b>What responses are identified that encourage creation/development of markets linked to ecosystem services?</b>	
27.1.1	3 tiers of responses are identified: Foundational - Knowledge and information are fundamental to any response; Enabling; Instrumental including markets and incentives, technologies and practices
27.1.1	Business and industry are identified as key actors for each of the 3 tiers of responses
27.2.3.5	Agri-environment schemes
27.2.3.7	Community infrastructure levy - raising funds from developers for green infrastructure
27.3.3.1, 27.3.3.3	Greater use of ecosystems in flood management
27.3.3.2	Water legislation is a significant driver for pollution control as well as flood risk management
27.3.3.3	Water demand management actions to reduce water stress
27.3.3.5	market based instruments in water sector include appropriate pricing of water resources, metering of use, tradable quotas, fees, permits and subsidies
27.3.3.5	PES schemes provide a means for better rewarding management of water quality and quantity by farmers and landowners
27.3.3.5	Tradable licenses for water abstraction
27.4.3.3	Agri-environment schemes create markets for ecosystem services
27.4.3.4	Markets for organic and ethical food and role of certification schemes
27.4.3.4	Reduction of food waste e.g. conversion to animal feed could save costs, create business opportunities and relieve pressures on agricultural ecosystems
27.4.3.5	Market creation in agriculture - agri-environment, set aside, cross compliance, energy crops and woodland grant schemes
27.4.3.5	Potential for carbon offset schemes to make payments to farmers
27.5.3.5	Certification schemes - woodland
27.5.3.5	Supply of woodfuel and biomass, woodland creation for amenity
27.5.3.6	Technology in forestry - harvesting machinery, biotechnology, new product development e.g. biochemicals from forest products, woodfuel technology, green infrastructure design e.g. noise control
27.6.3.4	Certification schemes, media campaigns, retailer initiatives driving more sustainable fisheries

27.6.3.5	Market creation in fisheries - conservation credits, supermarket purchasing, certification schemes
27.8.3.5, Box 27.40	Tourism and recreation - grants and certification schemes
27.9.3.5	Market creation - transport - road pricing, fuel tax, VED; emissions trading, renewables incentives in energy sector
27.10.5	market creation - general - environmental taxes, tradable permits, PES, agri-environment schemes
<b>What business opportunities arise from these responses?</b>	
27.2.3.1	Biodiversity knowledge development
Box 27.5	Wildlife gardening
27.2.3.4	Buying wildlife friendly/ sustainable products
27.2.3.6	Technologies that can conserve biodiversity: machinery for habitat restoration, fishing technology to reduce impacts on non-target species; agricultural techniques
27.2.3.6	Biodiversity offsetting
27.3.3.1	Water related knowledge
27.3.3.3	Water companies are trialling catchment interventions - 27 companies are planning to implement 100 catchment management schemes
27.3.3.5	Water metering - less than one third of households in England have a meter
27.3.3.6	Environmental technologies in water sector - leakage, pollution control, flood management, constructed wetlands to improve water quality, river restoration
27.4.3.1	Investment in knowledge, skills and technology for sustainable agriculture. Sustainable Agriculture and Food Platform has been created with £90m investment over 5 years and aims to support R&D in crop productivity, sustainable livestock production, waste reduction and management and greenhouse gas reduction
27.4.3.5	Role of diversified businesses on farms that benefit from ecosystem services
27.4.3.5	Role of supermarkets in driving change in agriculture
27.4.3.6	Technological opportunities in agriculture - integrated farm management, organic, water saving technologies, biotechnology, GM
27.5.3.1	Knowledge development in sustainable forestry
27.5.3.3, 27.5.3.4	Increased demand for woodfuel and biomass could driver increased management of small woodlands
27.6.3.1	Knowledge development - sustainable fisheries
27.6.3.4	market opportunities in sustainable seafood
27.6.3.6	Fishing technologies - more sustainable fishing gear
27.7.3.1	Marine and coasts - knowledge development
27.7.3.5	Technologies and practices - marine and coast - including coastal defences, managed realignment, beach nourishment, saltmarsh restoration and protection
27.8.3.1	Recreation and tourism - knowledge development
27.8.3.5	Role of media, including social networking and new media technologies, for engaging people with nature, market segmentation models for tourism and recreation
Box 27.38	Sustrans - economic opportunities from more sustainable travel and recreation
27.8.3.4, 27.8.3.5	Growth in outdoor tourism and recreation, including expenditures by wildlife tourists
27.9.3.1	Knowledge development - urban ecosystems - including £38 million Sustainable Urban Environment programme
27.9.3.3, 27.9.3.6	Green infrastructure - opportunities for integration into urban development
27.9.3.6	Energy technologies

27.1	Protecting the environment does not need to come at the expense of the economy and competitiveness. investment in nature can produce benefits that far outweigh costs...sustainable economic growth depends on healthy ecosystems
Box 27.54	Role of business in reducing plastic bag use
27.10.6	New technologies - e.g. green roofs
<b>What sectors are influenced by these responses?</b>	
27.1.4	Sectoral responses are identified: a) biodiversity; b) water; c) agriculture; d) forestry; e) fisheries; f) marine and coasts; g) recreation and tourism; and h) urban planning, transport and energy, but broader cross sectoral thinking to embed an ecosystem approach is also required
27.1	Biodiversity responses influence agriculture, fisheries, development
27.4	Agriculture, food sector, agricultural, environmental and water technologies - opportunities from responses in agricultural environment
27.3	Water sector, environmental technologies, agriculture - opportunities from responses in water environment
27.5	Forestry responses - impacts on forestry, energy sectors
27.6	Fisheries responses - fisheries, food and retail sectors
27.7	Marine and coastal responses - fisheries, energy, development, engineering, tourism and recreation
27.8	Tourism and recreation responses - tourism and recreation sectors
27.9	Urban responses - role of energy, transport and construction sectors



# ANNEX 4 – SCOPING STUDY CONCEPTUAL FRAMEWORK

## 1. PURPOSE OF THE CONCEPTUAL FRAMEWORK (CF)

The **purpose** of the CF is given in the call for proposals as follows:

1. In close discussion with the EMTF, develop a suitable framework for considering the scope for business opportunities underpinned by evidence from the UK National Ecosystem Assessment. This needs a strong conceptual framework that:
  - Uses the terms of the ecosystem services as set out in the NEA
  - Maps these services across to relevant business sectors.
  - Uses the NEA evidence on status and trends of different services and changes to their value/benefits in the context of what it could mean for the business sector
  - Takes into account important characteristics of delivery of ecosystem services and its benefits such as spatial scale
  - Allows for further work to be undertaken by ecosystem service, business sector, or by theme e.g. macro-economic
  - Makes use of, as appropriate, evidence from the NEA responses chapter within the context of the most recent Government Policy that interacts with the ecosystem services being studied.
2. Making use of this framework, to provide a review of the evidence from the NEA in the context of the business sector opportunities both currently and looking ahead to the medium term [e.g. 2020]. This requires innovation in thinking... the assessment should also recognise areas (i.e. stocks or flows) where the science or the economics suggests that the role of business may be more limited.

[our underlining]

It is clear from the above that the CF should be very much designed as a tool for analysis of the evidence provided by the NEA. Indeed, the call text makes clear that 'The study would not involve new empirical research but reviewing the NEA evidence...' However, the purpose of the CF may usefully be extended to help deliver the remaining objectives given in the call for proposals:

3. To provide an assessment of the appropriate actions to enable markets to contribute to delivery of major ecosystem service based goods not currently provided by the free market or under provided? This should ideally draw out (i) specific goods or business sectors where quick progress can be made, but also – where appropriate – highlight issues of a macro/ systemic nature; and (ii), where there is a business rationale for market provision independent of government action but where barriers might exist.
4. Recommendations for further work and analysis for EMTF based on understanding of some of the key areas for existing, new and emerging opportunities. Provide an initial view of how the work of the EMTF might best inform the next phase of the NEA. The main context for this specific study relates to UK ecosystems but wider implications for ecosystem market opportunities in an international context should be highlighted where relevant.

[our underlining]

It is also relevant to note the remit of the EMTF as specified in the Natural Environment White Paper, which states:

*“We want to gain the maximum benefit for UK businesses from new market opportunities which protect and improve natural capital. The Government will set up a business-led Ecosystem Markets Task force to review the opportunities for UK business from expanding green goods, services, products, investment vehicles and markets which value and protect nature’s services.”*

[our underlining]

Thus, the CF should enable the identification not of all business sector opportunities related to ecosystem services (ES) (some of which may have a negative impact on ES), but only those which expand green goods, services, products, investment vehicles and markets which value and protect nature’s services’.<sup>21</sup> Where the words ‘business opportunity’ are used below, we refer to such opportunities.

These opportunities may relate to what the NEA calls ‘final ecosystem services’ (e.g. water supply, hazard regulation), ‘goods’ (e.g. fibre, recreation) and ‘drivers of change’ (e.g. land management practices, supply chain practices).

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<sup>21</sup> The terms of reference for the current study (objective 3) further specifies enabling markets ‘to contribute to delivery of major ecosystem service based goods not currently provided by the free market or under provided.’

## 2. AVAILABLE EVIDENCE IN THE NEA

- *Chapter 1* of the NEA provides an introduction which introduces, *inter alia*, the ‘broad habitats’ used (Box 1.2, page 4-5) and the ES terminology (Box 1.3, page 5).
- *Chapter 2* describes the NEA Conceptual Framework, which provides a basis for the CF of the current study.
- *Chapter 3* outlines **drivers of change**, and can usefully inform our analysis in terms of the relevance of these drivers to business opportunities.
- *Chapter 4* examines the **links between biodiversity and ES** and can usefully inform our analysis of the potential impact of business opportunities on biodiversity as one important aspect of natural capital.
- *Chapters 5-12* present the **state and trends in each of the 8 broad habitat types**, along with the drivers of change and the ES provided and links to human wellbeing. They also explore trade-offs and synergies between different ES, sustainable management options, and knowledge gaps.
- *Chapters 13-16* assess **status and trends of the four main groups of ES** (Supporting, Regulating, Provisioning, Cultural), the **drivers of change for these ES** and the consequences.
- *Chapters 17-20* summarise the **habitat and ES assessments for each country** – England, Northern Ireland, Scotland, Wales. These provide some spatial differentiation in the evidence between countries.
- *Chapter 21* relates to the dependence of the UK on overseas ES and is of some relevance to our remit to consider, to a limited extent, business opportunities related to ES beyond the UK.
- *Chapters 22-24* assess the **economic, health and shared social values of ES** in the UK.
- *Chapters 25 and 26* examine future scenarios and the implications for the values of ES.
- *Chapter 27* identifies **response options**, including for business and markets. It considers a typology of options, namely foundational (knowledge, information), enabling (legislation, policies, institutions, governance), and instrumental (markets, incentives, technologies, practices, voluntary actions, education, awareness).

## 3. LINKS BETWEEN DRIVERS OF CHANGE, ECOSYSTEMS, ECOSYSTEM SERVICES AND BUSINESS OPPORTUNITIES

The conceptual framework for the NEA itself is given in *Figure 1* below. This shows ecosystems, which represent natural capital (stocks – of air, land, water and all living things) generating ecosystem services (flows). From these ES are developed goods which in turn deliver human well-being through their economic, health or shared (social) values. Social feedbacks, institutional interventions and responses relating to changes in human well-being arising from the goods developed on the basis of ES create drivers of (ecosystem) change, both direct and indirect, which may include demographic, economic, socio-political, technological and

behavioural drivers, management practices, and environmental changes (such as climate change). These drivers then impact on ecosystems, closing the circle in the framework.

**Figure 1: NEA Conceptual Framework** (NEA Figure 2.1, p13)

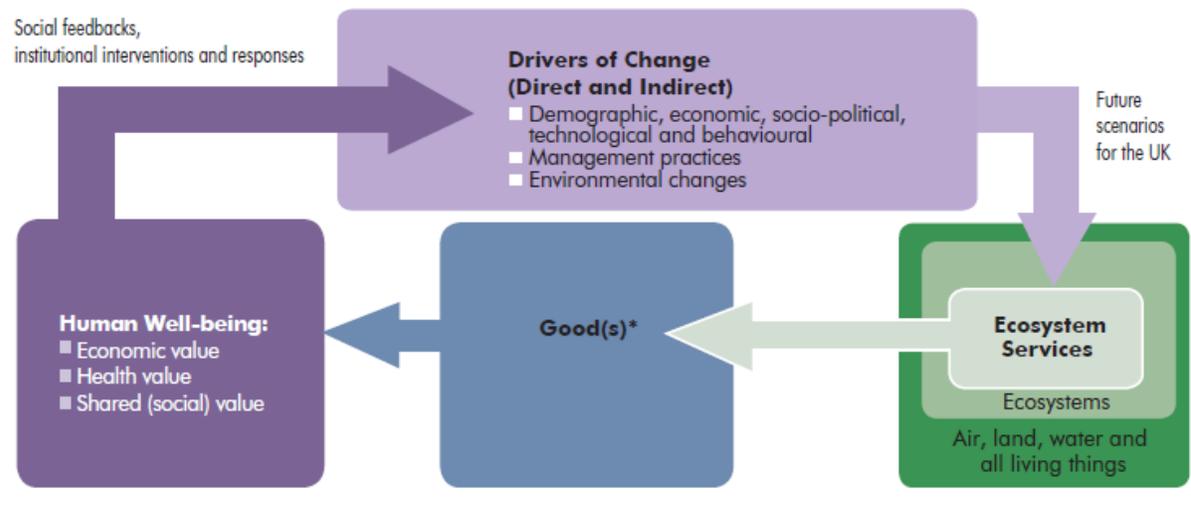


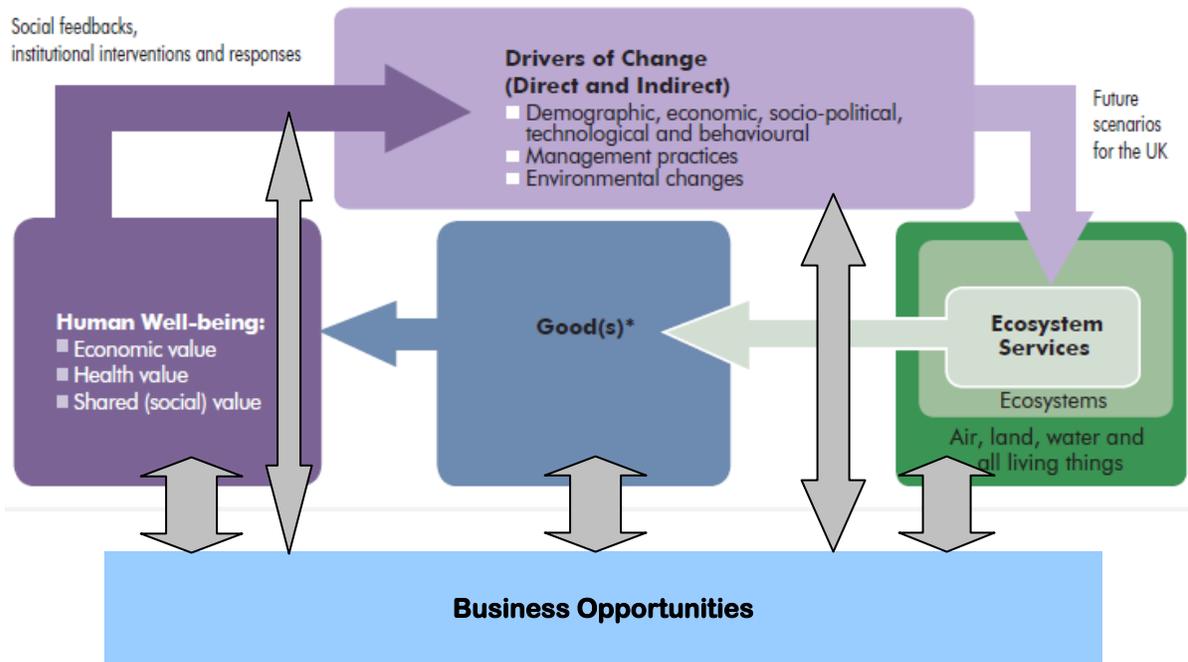
Figure 2, below, adapts the NEA framework, showing that business opportunities arise in relation to each stage of the cycle of the NEA framework. Broadly, these business opportunities arise from:

- Activities which **affect the drivers of change of ecosystems**, with a view to enhancing ecosystems and/or the ES they provide, or reducing pressures on ecosystems and the ES they provide (e.g. offsets, payment for ecosystem services, environmental technologies)
- Activities that **benefit from ES and the derivation of goods from ES**, and seek to internalise the value of, and enhance the delivery of, those ES (e.g. enhancing presence of and access to nature, organic farming produce, timber from forestry).
- Activities which **deliver human wellbeing from goods based on ES**, by realising the economic, health and/or social (shared) values of these goods (e.g. ecotourism, certification of forest and agricultural produce)

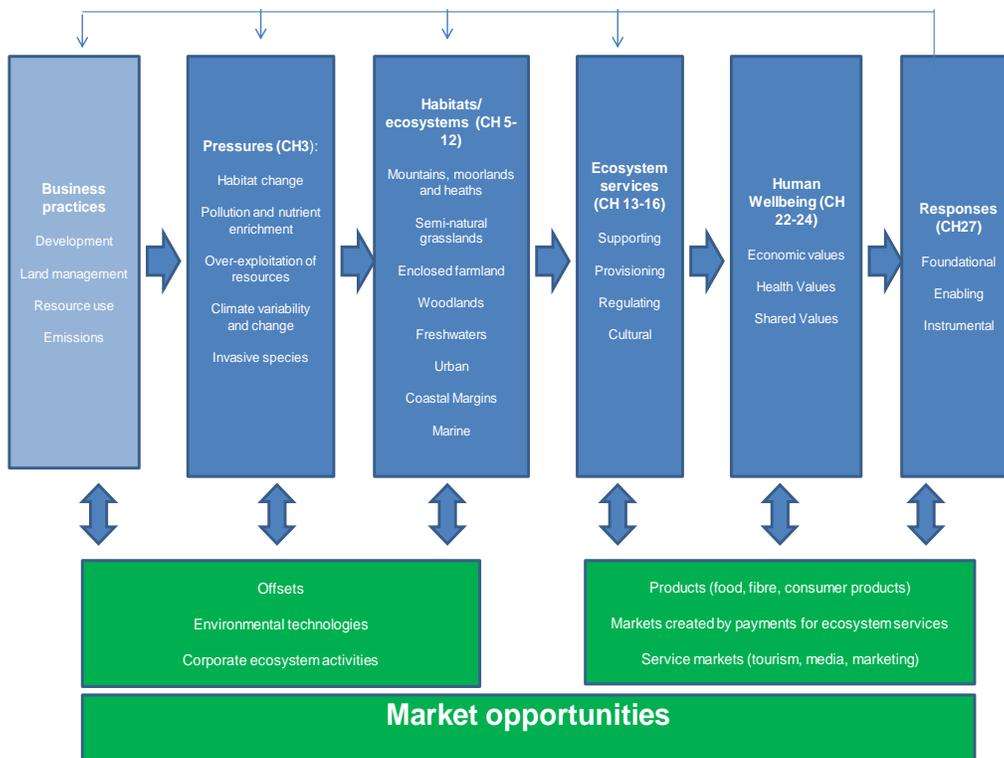
Figure 3, below, maps the links between the NEA chapters and the business opportunities that relate to ecosystems and ES. It follows that identifying business opportunities requires us to examine:

- the **drivers of change and resulting pressures** affecting ecosystems (and how business may help to address them) (NEA chapter 3)
- the **state of and trends in ecosystems** (NEA chapters 5-12 & 17-20)
- the **state of and changes in value of ES** (NEA chapters 13-16 & 17-20)
- the **values of ES in relation to human well-being** (NEA chapters 22-24); and
- the **range of business-related response options, their market potential, and related enabling actions** (NEA chapter 27).

**Figure 2: Relationship of business opportunities to the NEA conceptual framework**



**Figure 3 Links between NEA chapters and business opportunities**



We can categorise these different business opportunities in various ways:

- (1) as **new markets** or **greening of existing markets**;
- (2) by **business sector**, including: agriculture, forestry, fishing, mining and quarrying, food manufacturing, pharmaceuticals, other manufacturing, energy, water and waste water, construction, transport, tourism and recreation, wholesale and retail, creative, media and marketing, financial services, consultancy, public administration, education;
- (3) by **type of market opportunity** and/or **type of intervention or instrument** designed to support these opportunities, including the following :
  - **Product markets** – ecosystem friendly food, timber, consumer products
  - **Offsetting** – activities that offset negative impacts of business on biodiversity, carbon and/or other ES
  - **Payments for ecosystem services** – e.g. protection of water quality, alleviation of flooding
  - **Environmental technologies** – goods and services that serve as substitutes, reduce degradation, restore ecosystems or increase efficiency of ES use (including material flow analysis, and technologies for water and waste water management, sustainable agriculture, sustainable fishing, climate change mitigation, control of invasive alien species).
  - **Markets for cultural services** – e.g. ecotourism, visitor payback schemes, media, marketing, education
  - **Financial and legal services** (banking, investment, accounting, insurance, legal services)
  - **Ecosystem knowledge economy** – skills and knowledge relating to ecosystems and their services
  - **Corporate ecosystem initiatives** (assessment, standards, planning, monitoring, reporting)
  - **Eco-taxes, charges, levies, subsidies, grants, green procurement**
- (4) in relation to **market or non-market benefits** (*Table 1*).

Various **important characteristics of ecosystems and ES** affect their suitability to different types of business opportunity. Relevant characteristics and initial thinking on their relationship to market structures are discussed in *Table 2*.

**Table 1: Business opportunities categorised by market and non-market benefits of ES**

Type of benefits	Market benefits	Non-market benefits	
		Private benefits – finite number of identifiable beneficiaries	Public good aspects – many beneficiaries
<b>ES examples</b>	Food, timber	Pollination, water quality, flood management, recreation	Biodiversity, climate regulation
<b>Market opportunities</b>	Greening of existing markets	Creation of private markets	Creation of public markets
<b>Possible initiatives</b>	Certification, labelling, procurement conditions, voluntary measures	PES schemes, visitor payback, insurance, voluntary measures	Public PES schemes (e.g. agri-environment), public-private partnerships, compliance markets, voluntary measures

**Table 2: Important characteristics of ecosystem services in relation to business opportunities**

Characteristics	Influence on Market Structures
A. Scale (size & trend) of the externalities involved.	<p>This defines the scale of market opportunity, and therefore the potential scale of upfront investment in supply.</p> <ul style="list-style-type: none"> <li>e.g. the severity and ubiquity of carbon emissions externalities justifies national and international regulatory systems, and large scale investments</li> </ul>
B. Nature of market failures involved (public goods, information failures etc).	<p>Different types of failures suggest different responses:</p> <ul style="list-style-type: none"> <li>Pure public goods require some public policy intervention.</li> <li>Information failures can be corrected by retail product differentiation (labelling), or by communication routes between buyers and sellers.</li> <li>Externalities can be corrected by market mechanisms, such as taxes, tradable permits, etc...</li> </ul>
C. Business' (& sectors') dependency on them, and the costs and availability of substitutes.	<p>Where business has high dependency on valuable external services (see A) this represents an uncontrolled risk, which they may be willing to pay to reduce.</p> <p>Where multiple businesses/sectors are involved, this can restrict clear expression of demand.</p> <ul style="list-style-type: none"> <li>e.g. a cluster of businesses in a flood-risk area are dependent on catchment-wide water quantity regulation services, but are likely to have separate insurers and no means to arrange a transaction with those influencing the flood risk.</li> <li>e.g. bottled water producers in France (Volvic and Vittel) both have PES deals with farmers to reduce the diffuse pollution in runoff from their land that enters the</li> </ul>

Characteristics	Influence on Market Structures
	groundwater they extract and bottle. Their business model has no substitute for this groundwater resource in relation to the respective brands.
D. Opportunity costs related to ecosystem service provision.	<p>This will influence the price and/or supply of the ecosystem goods/services</p> <ul style="list-style-type: none"> <li>e.g. managed realignment payments for taking land out of agricultural production and therefore no longer qualifying for agricultural production support payments.</li> </ul>
E. Nature of property rights over the ecosystem services or the environmental assets underpinning them.	<p>This influences how a product can be defined by sellers. Property rights rarely fit neatly to environmental capital providing services, and this mismatch can restrict clear expression of supply (e.g. catchment PES deals need to sign up sufficient land managers in the catchment).</p>
F. Feasibility of managing the services, and the speed and predictability with which they respond to management.	<p>This will affect the certainty and timescales over which supply can be offered.</p> <ul style="list-style-type: none"> <li>e.g. if developing biodiversity enhancement to sell in biodiversity offsets markets, there are environmental advantages to habitat banking in stimulating enhancement activity ex-ante of the damage they compensate for, as this reduces the risk that the enhancements will fail to meet their objectives. Ex-ante) work of this type carries a risk of not finding a suitable purchaser for the offset, but this can be mitigated by less favourable treatment in equivalence calculations of proposed enhancements compared to those already undertaken. For proposed offsets, management plans showing how enhancements will be realised are required, and this mitigates the risks of slowness and unpredictability in the results of biodiversity enhancements.</li> </ul>
G. Capital costs of altering their management and provision.	<p>Higher upfront costs may require financing vehicles to invest in ES supply. Where supply is also long-term, PPP structures may be suitable.</p> <ul style="list-style-type: none"> <li>e.g. The well-known SCAMP project involved a large upfront investment by the water company (e.g. in farm capital), which was feasible given their large business size and reliability of future revenues from regulated customer prices. In other circumstances the same ES management costs and benefits may exist, but without the capital investment capacity, PES deals will not be possible.</li> </ul>
H. Spatial and socio-economic distribution of ecosystem service beneficiaries: in particular are they organised in a coherent group that can take part in transactions?	<p>Where beneficiaries are not organised in a coherent group (e.g. people living on floodplains) then this can restrict clear expression of demand. (similar to C, but also for consumers/ households)</p>

Characteristics	Influence on Market Structures
I. Spatial and economic distribution of ecosystem service providers.	This adds a spatial element to E, and will influence F, and the ability of others to contract F. Management actions may be needed over a coherent area (e.g. hydrological unit) and therefore all providers in that unit need to be involved. The distribution of providers influences how they can be targeted with policy instruments (e.g. offsets regulations require a trigger point, taxes require a transaction point).
J. Spatial and temporal relationships between ecosystem service providers and beneficiaries.	Intergenerational disconnects between provider and beneficiary necessitate an intermediary body in transactions. Spatially, provision of some ecosystem services is very location sensitive (e.g. recreational amenity), and geographical labelling may be important to some branding.
K. The nature of existing cultural, regulatory or market management structures – including ‘direction of travel’ (i.e. current government intentions as regards forthcoming regulation or other approaches)	Existing structures may inhibit market options. <ul style="list-style-type: none"> <li>• E.g. fishing activity is reflected in quotas, but there is no ‘license to fish’ which makes targeting of policy instruments and labelling of fisheries harder.</li> </ul>

#### 4. ANALYTICAL OBJECTIVES OF THE CONCEPTUAL FRAMEWORK AND METHODS FOR ITS APPLICATION

To identify business opportunities we need to examine both:

- The role that business can play in reducing pressures on ecosystems and in enhancing and restoring ecosystems; and
- The business opportunities provided by ecosystem goods and services.

We set out below a set of **Analytical Objectives** (AOs) and related **methods** designed to extract evidence from the NEA – on drivers and pressures, state and trend of ecosystems, state and changes in ES, and response options – from which we might infer such business opportunities. The focus of the analysis must be on the business linkages to drivers and pressures, ecosystems and ES (the links between drivers, ecosystems and ES are already well documented in the NEA summaries).

##### **AO1: To review the drivers and pressures on ecosystems and map these to relevant business sectors and to relevant types of business opportunity**

This will involve answering, with reference to NEA chapter 3 (and 17-20):

- What are the main drivers and pressures on UK ecosystems? How do these differ by country?
- How do various business sectors relate to these drivers and pressures, i.e. how have business activities by sector acted as drivers or pressures (either positive or negative) of change in UK ecosystems? Which sectors and/or practices generate the most significant

- drivers and/or pressures? What potential solutions may there be to enhance positive or reduce negative drivers and/or pressures?
- How might various types of business opportunity relate to these drivers and pressures, in terms of current and potential contribution of each type of opportunity to enhancing or reducing each driver or pressure? Which types of business opportunity have or might have greatest positive impact in terms of reducing drivers or pressures?

**A02: To review the state and trends of ecosystems (broad habitats) and map these to relevant business sectors and to relevant types of business opportunity**

This will involve answering, with reference to NEA ch 4, 5-12 and 17-20:

- What are the state and trends for each broad habitat type? Which states and trends are of particular concern (e.g. poor state and/or rapid negative trend)? And how do these differ by country?
- How do various business sectors affect these states and trends and through what activities? What sectors and activities might have greatest positive impact in terms of enhancing states and/or positive trends? Which states and trends may be irreversible or otherwise not amenable to business solutions?
- How might various types of business opportunity relate to these states and trends, in terms of improving or worsening certain states and trends? Which types of business opportunity have or might have the greatest positive impact of certain states or trends?

**A03: To review the states of and changes in ES and map these to relevant business sectors and to relevant types of business opportunity**

This will involve answering, with reference to NEA chapters 13-16 (and 17-20):

- What are the states and changes in ES? Which states and changes are of particular concern? How do these differ by country?
- How do various business sectors relate to these states and changes, i.e. how have business activities by sector affected the states of and changes in ES, and which business sectors benefit from these ES? What sectors and business activities have potential for greatest positive impact in terms of enhancing states and/or positive changes of ES?
- How might various types of business opportunity relate to these states of and changes in ES, in terms of improving or worsening certain states and changes? Which types of business opportunity have or might have the greatest positive impact on certain states of or changes in ES?

The answers will be compared with those for A01 and A02 to identify linkages.

**A04: To review the values and changes of values of each ecosystem service to map these to relevant business sectors and to relevant types of business opportunity**

This will involve answering, with reference to NEA chapters 22-24:

- What are the values (economic, health, and shared social values) and changes of values of ES? Which are market and which non-market values? Which values and changes of value are of particular note?
- How do various business sectors relate to these values and changes of value, i.e. can we disaggregate these values by business sector, can we identify sector impacts on ES values? What sectors might have greatest positive impact in terms of enhancing ES

- values? What potential is there to create markets for non-market ES values and in what sectors?
- How might various types of business opportunity relate to these values and changes of value, in terms of enhancing or reducing certain values, or creating markets for non-market ES values? Which types of business opportunity have or might have greatest positive impact on ES values?

The answers will be compared with those for A03 to identify linkages.

**A05: To review important characteristics of ES delivery and map these characteristics to those ES identified under A03 and A04 above as offering significant potential for business opportunity**

This will involve answering, with reference to NEA chapters 13-16 and table 2 above:

- What are the important characteristics of ES delivery?
- How do various business sectors relate to these characteristics? What sectors might profitably work with and/or accommodate these characteristics?
- How might various types of business opportunity relate to these characteristics? Which types of business opportunity have or might have the greatest potential in consideration of these characteristics?

The answers will be compared with those for A03 and A04 to identify linkages.

**A06: To review, for each significant business opportunity identified by the foregoing analysis, the means to enable each opportunity.**

This will involve answering, with reference to NEA chapter 27:

- What is the range of enabling actions available (foundational, enabling, instrumental)?
- Which of the range of available actions are of most relevance to each business opportunity?
- What barriers exist to these enabling actions?

**A07: To assess the market potential for each emerging business opportunity and rank most-promising business opportunities**

This will be assessed with reference to chapters 25-26 (scenarios), the results from A06, and on the basis of criteria which might include:

- Contribution to tackling risk facing business (including policy risks)
- Financial viability of the opportunity (source of profit, risk/reward balance)
- Potential demand underpinning the opportunity (number of beneficiaries and values to them)
- Scalability and transferability of good practice, including public action leveraging private activity
- Presence/availability of leaders and innovators (who will do proof of concept?)
- Presence/availability of 3<sup>rd</sup> party brokers and intermediaries (can providers and beneficiaries be connected?)

- Feasibility of overcoming any barriers (e.g. what are vested interests in retaining barriers?)
- Strength of underpinning evidence (e.g. uncertainty in ecosystem responses to management)
- Potential role for SMEs
- Short-term payback potential
- Job creation potential (employment intensity of activities)
- Long-term potential for competitive UK advantage

**AO8: To identify key areas of further work required in relation to the most-promising opportunities**

This will involve assessing what further work the EMTF may pursue, bearing in mind the resources at its disposal, as well as further work that may be done by other bodies, taking into account relevant work in progress.

The results of the analysis will be presented where possible with summary matrices and explanatory text, referenced to the relevant section of the NEA, in order to demonstrate a structured review of the NEA.

# ANNEX 5 – TERMS OF REFERENCE

## 1. Project Title

Review of NEA evidence to assess scope for business related ecosystem market opportunities in the UK and appropriate tools for business sector uptake

## 2. Project summary

The aim of this project is to feed into the early stages of the business led Ecosystem Markets Taskforce, a commitment in the Natural Environment White Paper to review the opportunities for UK business from expanding markets which value and protect nature's services. It provides an opportunity to embed the innovative thinking from the UK National Ecosystem Assessment (NEA) into a UK business context.

The overall aim of the project is to provide a review of the evidence from the NEA in the context of business related ecosystem market opportunities and to assess the appropriate tools for enabling these opportunities to be realised in practice. The project would involve, in close discussion with the Task Force, the development of a suitable framework for considering the scope for business opportunities and provide a review of the evidence from the NEA in terms of current and medium term opportunities. It would provide an assessment of the appropriate actions for enabling markets and recommendations for further work and analysis for the Task Force based on understanding of some of the key areas for existing, new and emerging opportunities.

The project is for immediate start (revised start date 9th March 2012) with a final report likely to be required by 4<sup>th</sup> May 2012.

## 3. Description of Project

### *Aims of project*

Overall aim: To provide a review of the evidence from the NEA in the context of business sector opportunities and to assess the appropriate tools for enabling business sector involvement in the provision of major ecosystem service based goods.

### *Objectives*

1. In close discussion with the EMTF, develop a suitable framework for considering the scope for business opportunities underpinned by evidence from the UK National Ecosystem Assessment. This needs both a strong conceptual framework that:
  - Uses the terms of the ecosystem services as set out in the NEA
  - Maps these services across to relevant business sectors.

- Uses the NEA evidence on status and trends of different services and changes to their value/benefits in the context of what it could mean for the business sector
  - Takes into account important characteristics of delivery of ecosystem services and its benefits such as spatial scale
  - Allows for further work to be undertaken by ecosystem service, business sector, or by theme e.g. macro-economic
  - Makes use of, as appropriate, evidence from the NEA responses chapter within the context of the most recent Government Policy that interacts with the ecosystem services being studied.
2. Making use of this framework, to provide a review of the evidence from the NEA in the context of the business sector opportunities both currently and looking ahead to the medium term [e.g. 2020]. This requires innovation in thinking – the EMTF are looking at both potential for creating new markets based on ecosystems (e.g. habitat banking, payments for ecosystem services) but also in terms of greening existing markets (e.g. certification schemes, new technologies). However the assessment should also recognise areas (i.e. stocks or flows) where the science or the economics suggests that the role of business may be more limited.
  3. To provide an assessment of the appropriate actions to enable markets to contribute to delivery of major ecosystem service based goods not currently provided by the free market or under provided? This should ideally draw out (i) specific goods or business sectors where quick progress can be made, but also – where appropriate – highlight issues of a macro / systemic nature; and (ii), where there is a business rationale for market provision independent of government action but where barriers might exist
  4. Recommendations for further work and analysis for EMTF based on understanding of some of the key areas for existing, new and emerging opportunities. Provide an initial view of how the work of the EMTF might best inform the next phase of the NEA. The main context for this specific study relates to UK ecosystems but wider implications for ecosystem market opportunities in an international context should be highlighted where relevant.

### ***Plan of work***

Team requirements: We would envisage a fairly wide collaborative effort that could draw upon expertise across the NEA in a multidisciplinary way but also ensure that the work was underpinned by expertise in the business sector so that the outputs can be of most relevance and use in the subsequent work of the EMTF. Ultimately, the Task Force exists to help identify innovative market-based solutions to value & protect nature and it is keen to ensure that as broad a dialogue as possible with Government and business underpins this outcome. Interested parties should therefore bear this in mind in all aspects of their proposal including outputs, approach to the review, and project team capabilities.

Suggested plan of work: The work would be conducted over a short time scale and would be expected to start immediately (revised start date: 9 March 2012) with a final report by 4 May

2012. The study would not involve new empirical research but reviewing the NEA evidence in the context of the requirements of the EMTF.

#### ***Desirable specific outputs***

The main output will be a report to the EMTF which would be required by 4 May 2012. This would provide input into the next EMTF meeting to be held in May 2012 and could help to inform, along with other evidence, an interim report to be published by the Task Force.

The report to the EMTF and the underpinning evidence will need to be structured with the business led Task Force members in mind in order to help the Task Force to take these findings and apply their expertise to consideration of the implications for business opportunities. Similarly, although we expect the final EMTF report to provide recommendations to government, the report is also expected to be just as relevant and important for a business audience and is likely to explore options for UK businesses to realise these opportunities in practice.

#### **4. Benefits of the Research**

The role of the Ecosystem Markets Task Force (EMTF) is to advise the Secretaries of State for Defra, DECC and BIS through the Green Economy Council about the opportunities for UK business from expanding green goods, services, products, investment vehicles and markets which value and protect ecosystem services.

See <http://www.defra.gov.uk/ecosystem-markets/> for further background or contact the secretariat at: [ecosystemmarketstaskforce@defra.gsi.gov.uk](mailto:ecosystemmarketstaskforce@defra.gsi.gov.uk)

The key benefits of the research will be to enable the Ecosystem Markets Taskforce to build on the robust underpinning evidence provided by the NEA on the value of the natural environment and generate key evidence for the early stages of the EMTF work (in particular the interim report to be published by the EMTF) scoping out the business opportunities linked to ecosystems. This will enable the EMTF to have a strong analytical and evidence base underpinning its work which will be an important factor in ensuring the outputs of the taskforce are credible and robust across a range of stakeholders.

It should link well into other projects and initiatives that are looking at natural value and the role of the business sector as one of the potential key actors in ecosystem management. The published report and dissemination activities by the EMTF and taskforce members with the wider business community will provide good opportunities to understand better the role of the private sector in taking forward ecosystem market related opportunities which value and protect the natural environment.



## ANNEX 6 – PROFILES OF STUDY TEAM MEMBERS

### **GUY DUKE (Independent) – Principal Investigator (ES Markets)**

*movalliduke@skynet.be*

Guy Duke is a consultant on ecosystem services (ES) markets, policy, research and knowledge exchange, and an experienced team leader. Recent work includes leading high-level workshops on habitat banking at the EC and European Parliament, input to a study on Innovative Financial Instruments for the EC, and advice to The Environment Bank Ltd on EU policy, EU finance and business opportunities in Europe. He is Independent Member of the Joint Nature Conservation Committee, to which he was appointed on the basis of his ES expertise. He is Senior Visiting Research Associate, Oxford Environmental Change Institute; current research interests focus on operationalising ES. He is an evaluator of EC FP7 projects and proposals on biodiversity and ES. Guy was previously (2002-07) Principal Administrator Biodiversity Policy, EC in which capacity he introduced the ES paradigm to EU policy and was a key player in launch of 'The Economics of Ecosystems and Biodiversity' (TEEB). From 1998-2002, he led the biodiversity and natural resources management practice for ERM, directing projects for The World Bank, EC and UK government. In his early career he led a pioneering conservation and development project in the Western Himalayas for BirdLife International funded by major donors.

### **IAN DICKIE (eftec) – Co-Investigator (Environmental Economics & Markets)**

*lan@eftec.co.uk*

Ian Dickie is senior consultant environmental economist at eftec. Current and recent work includes: analysis of innovative use of financial instruments for biodiversity conservation; potential to use habitat banking in UK and Europe; impact assessments for designation of marine conservation sites in the UK. Ian has managed projects assessing the impacts of diverse environmental policies, from CITES implementation to information services for small businesses, and advised OSPAR and UK Government on the requirements of the Marine Strategy Framework Directive. Prior to working at eftec, Ian was involved a wide variety of economics issues affecting UK and EU environmental policies as head of economics at the RSPB. His experience includes development of economic tools to support the Water Framework Directive, flood risk management adaptation to climate change, impacts of renewable energy development projects and membership of Defra's regulatory challenge panel. Ian is a Director of the Aldersgate Group, which champions the role that strong environmental regulation can play in economic growth, for whom he has co-authored papers on resource efficiency and the competitiveness impacts of the EU Emissions Trading Scheme.

### **TONY JUNIPER (Independent) – Co-Investigator (Corporate Sustainability)**

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Tony is a sustainability and environment adviser, including as Senior Associate, University of Cambridge Program for Sustainability Leadership (CPSL) and Special Advisor, Prince's Charities International Sustainability Unit. He advises international companies, independently and as a founder member of Robertsbridge Group. He speaks and writes on sustainability, chairs the 10:10 climate change campaign and Action for Renewables, and is Editor of GREEN magazine. He began his career as an ornithologist with Birdlife International. From 1990 he worked at Friends of the Earth including as Executive Director (2003-08) and as Vice Chair, FoE International (2000-08). Recent relevant activities include: (a) work with CPSL to understand private sector perspectives on natural capital in advance of Rio +20; (b) research for new book, *what has Nature ever done for us?*; (c) research to underpin proposals for The Prince's Rainforests Project Emergency Package to slow tropical deforestation; (d) work with individual companies (e.g. Nestle) to understand how business strategy might best engage with natural capital questions. He is

author of several books, including the award winning *Parrots of the World*, *Spix's Macaw* and *How Many Light Bulbs Does It Take To Change A Planet?*

**KERRY ten KATE (Independent) – Co-Investigator (Offsetting)**

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Kerry has researched best practice in biodiversity offsets and conservation banking in approximately 30 countries. She founded and has directed for 7 years the Business and Biodiversity Offsets Programme (BBOP), a multi-stakeholder group of 80 representatives from companies, financial institutions, governments (including Defra) and conservation organizations. BBOP has undertaken research, pilot projects and developed and agreed Handbooks on biodiversity offset design and implementation, and agreed a Standard on Biodiversity Offsets released in January 2012. Kerry has advised governments on biodiversity offset policy and on the potential for offset markets and opportunities for businesses to offer ecosystem-based goods and services. She has created tools for assessing business' response to biodiversity and ecosystem opportunities and threats, such as Insight Investment's Biodiversity Benchmark (now subsumed into the Net Value Initiative). She was a contributing author to the Millennium Ecosystem Assessment and cited in various reports of TEEB. She led a research project for Forest Trends on the demand by businesses for ES.

**MAVOURNIEN PIETERSE (GHK) – Co-Investigator (Project Manager)**

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Mavourneen Pieterse is a Senior Consultant at GHK specialising in environmental policy and its linkages with economic development with a focus on biodiversity and ES. She currently manages studies for Defra on incentive measures for biodiversity, and the role of potential deadweight in the Environmental Stewardship scheme, and an EC project exploring potential for an EU habitat banking scheme. Previous projects include: on green infrastructure (for EC); links between biodiversity, ES and employment (for EC); potential for biodiversity offsetting in the UK (Defra); opportunity costs of biodiversity action (EC); examination of Natura 2000 co-financing arrangements (EC); assessment of socio-economic benefits of SSSIs (Defra). Mavourneen worked previously at Chatham House in the Energy, Environment and Development Programme and at the Energy Efficiency Advice Centre in Changeworks.

**MATT RAYMENT (GHK) – Co-Investigator (Environmental Economics and Markets)**

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Matt Rayment, Principal, GHK, is an economist with >20 years' experience in policy research and appraisal and particular interest in biodiversity and ES. He has led recent studies for Defra on incentives for biodiversity, costs of implementing biodiversity offsets, and economic appraisal of ES delivered by Environmental Stewardship. For the EC, he has examined costs, benefits and financing options of Natura 2000, market instruments for biodiversity, and global costs of policy inaction for biodiversity and ES. He is currently assessing potential demand, supply, cost and design issues of developing habitat banking at EU level. Matt has extensive experience in economic development, including market appraisals, sector studies, development strategies and economic impact assessments for government and regional development agencies. Before joining GHK in 2002 he was Head of Economics at RSPB, where he led research examining the economic benefits of nature conservation and wildlife tourism. Before that he was Research Manager at Ecotec, where he undertook research into environmental technologies and markets.

**MOHAMMAD RAFIQ (Independent) – Co-Investigator (Product markets and certification)**

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Mohammad Rafiq performed this study in his independent capacity. He is Senior Vice President, Rainforest Alliance (RA), a leading NGO with a mission to mobilize markets in support of biodiversity conservation and livelihoods. RA has an increasingly recognized agricultural certification system; several large brands

(e.g. Unilever, Mars, Chiquita) carry the RA Certified (frog) label. The RA farm certification body (Sustainable Farm Certification International) reports to Mohammad. RA is also involved in other market-based ES, especially carbon sequestration as a measure to mitigate climate change. RA undertakes verification and validation of bio-carbon projects, and provides policy and training support in this area; this work is lead by the Climate Program that Mohammad supervises. In his previous job at the International Union for Conservation of Nature (IUCN) he was Head, Business and Biodiversity Program in which capacity he led development and oversaw implementation of several high profile private sector partnerships including with Shell International (Holland), International Council of Mining and Metals (London, UK), Rio Tinto (UK) and Holcim (Switzerland).

**STEVEN SMITH (URS) – Co-Investigator (Payment for Ecosystem Services)**

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Steven has successfully delivered numerous research studies in relation to biodiversity and ES including a recent study on *Barriers and opportunities to the use of payments for ecosystem services* for Defra. Current projects include leading development of a Best Practice Guide on PES (Defra) and economic evidence, analysis and appraisal for the Independent Panel on Forestry. Steven is assisting the Marine Management Organisation with developing and appraising the first Marine Plans for England and UNDP with identifying priorities and incentives for Sustainable Land Management in Guyana. He has over nine years of research and consultancy experience and has a particular specialism in spatial planning and appraisal. He is retained by the Government's Planning Advisory Service to assist local authorities with plan-making and has undertaken strategic environmental assessments / sustainability appraisals across a range of sectors including land use planning, minerals, transport and waste. Steven's other recent projects include a briefing note on ES for the mining sector on behalf of the International Council on Mining and Metals and an exploration of 'environmental limits' in the South East for the former regional planning body.

**NICK VOULVOULIS (ICL) – Co-Investigator (Environmental Technologies)**

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Nick is a Reader in Environmental Technology at Imperial College's Centre for Environmental Policy. He has extensive expertise in environmental technology, the application of science and engineering to address environmental challenges. Dr. Voulvoulis heads the Environmental Quality Research Group at Imperial at the Centre for Environmental Policy. A particular focus of his work is producing integrated, interdisciplinary and highly relevant research in close collaboration with businesses and industry. This includes work on water and wastewater treatment technologies, chemicals in the environment, waste and resources management and technologies, and environmental risk assessment. His business links include as coordinator of the strategic partnership between Imperial and Anglian Water, advisor to Veolia Environmental Services, and research work for several UK water companies. Of particular note is his work with Anglo-American on environmental management in mining, and with BP on innovation in land remediation and water reuse. Dr. Voulvoulis has also recently been commissioned by NERC and Defra to conduct a project to relate WFD implementation benefits to ES, and identify better ways of communicating ES outcomes to stakeholders, in relation to water management.