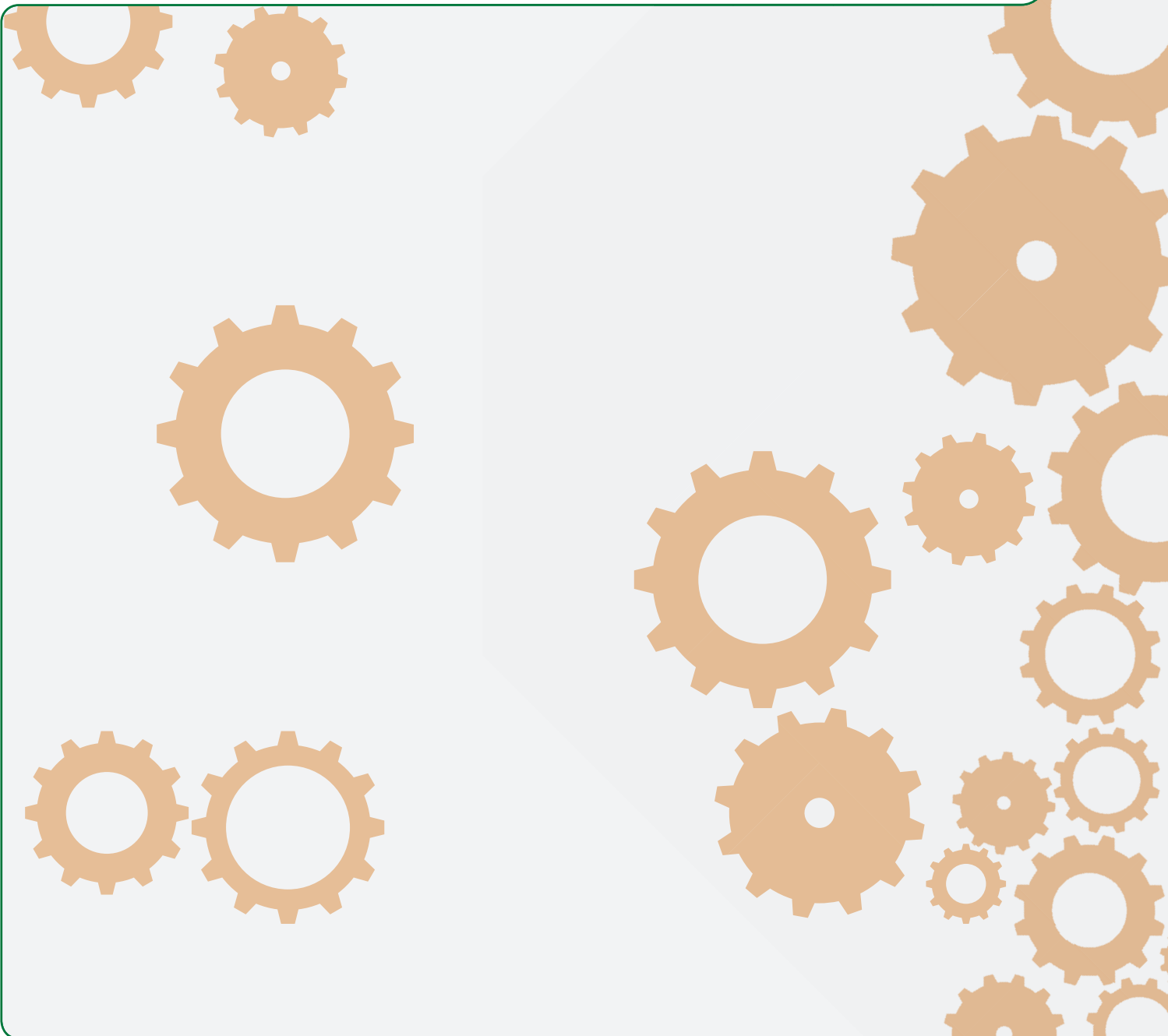


UK National Ecosystem Assessment Follow-on

Work Package Report 10:
Tools – Applications, Benefits and Linkages
for Ecosystem Science (TABLES)



Principal Investigator: Alister Scott^{1*}

Authors: Alister Scott¹, Claudia Carter¹, Oliver Hölzinger², Mark Everard³, David Rafaelli (Report Review Editor)⁴, Michael Hardman⁵, Jonathan Baker⁶, Jayne Glass⁷, Karen Leach⁸, Richard Wakeford¹, Mark Reed¹, Mike Grace⁹, Tim Sunderland⁹, Ruth Waters⁹, Ron Corstanje¹⁰, Ryan Glass¹¹, Nick Grayson¹², Jim Harris¹⁰, Antony Taft¹

Advisors: Sarah Buckmaster¹³, Charles Cowap¹⁴, Anna Evely¹⁵, Paul Gibbs¹⁶, Mike Kelly¹⁷, Jasper Kenter¹⁸, Tim Pagella¹⁹, Jonathan Porter²⁰.

Affiliations:

¹ Birmingham City University

² Consultant

³ Pundamilia Ltd.

⁴ University of York

⁵ University of Salford

⁶ Collingwood Environmental Planning

⁷ University of the Highlands and Islands

⁸ Localise West Midlands

⁹ Natural England

¹⁰ Cranfield University

¹¹ Big Toe Design

¹² Birmingham City Council

¹³ Independent Consultant

¹⁴ Royal Institution of Chartered Surveyors

¹⁵ Project Maya

¹⁶ David Jarvis Associates

¹⁷ Rural Planning Associates

¹⁸ University of Aberdeen

¹⁹ Wales Environment Centre

²⁰ Ecosystems Knowledge Network

*Correspondence to: Alister Scott, Alister.Scott@bcu.ac.uk

Suggested citation: Scott, A., Carter, C., Hölzinger, O., Everard, M., Rafaelli, D., Hardman, M., Baker, J., Glass, J., Leach, K., Wakeford, R., Reed, M., Grace, M., Sunderland, T., Waters, R., Corstanje, R., Glass, R., Grayson, N., Harris, J., & Taft, A. (2014) UK National Ecosystem Assessment Follow-on. Work Package Report 10: Tools – Applications, Benefits and Linkages for Ecosystem Science (TABLES). UNEP-WCMC, LWEC, UK.

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Abbreviations and Acronyms

| | |
|---------------------|---|
| AONB | Area of Outstanding Natural Beauty |
| ARIES | Artificial Intelligence for Ecosystem Services |
| CBA | Cost Benefit Analysis |
| CBD | Convention on Biological Diversity |
| CCW | Countryside Council for Wales |
| CEA | Cost-Effectiveness Analysis |
| CEV | Corporate Ecosystem Valuation |
| CICES | Common International Classification of Ecosystem Services |
| COP | Conference of the Parties |
| DCLG | Department for Communities and Local Government |
| Defra | Department for Environment Food and Rural Affairs |
| DTC | Duty to Co-operate |
| EIA | Environmental Impact Assessment |
| EMAS | Eco-Management and Audit Scheme |
| ESF | Ecosystem Services Framework |
| ESPA | Ecosystem Services Poverty Alleviation |
| FSC | Forest Stewardship Council |
| GBS LEP | Greater Birmingham and Solihull Local Enterprise Partnership |
| GDP | Gross Domestic Product |
| GIS | Geographic Information Systems |
| HLS | Higher Level Stewardship |
| IA | Impact Assessment |
| IEMA | Institute of Environmental Management & Assessment |
| INCA | Industry Nature Conservation Association |
| InVEST | Integrated Valuation of Ecosystem Services and Tradeoffs |
| IOW | Isle of Wight |
| IPCC | Intergovernmental Panel on Climate Change |
| LEP | Local Enterprise Partnership |
| LNP | Local Nature Partnership |
| L&Ove | Lewes & Ouse Valley economics Group |
| LUCI | Land Utilisation & Capability Indicator mapping |
| MA | Millennium Ecosystem Assessment |
| MCDA | Multi-Criteria Decision Analysis |
| NCAs | National Character Areas |
| NCAC | Natural Capital Asset Check |
| NEAT Tree | National Ecosystem Approach Toolkit Tree |
| NIA | Nature Improvement Area |
| NPPF | National Planning Policy Framework |
| NRW | Natural Resources Wales |
| OECD | Organisation for Economic Co-operation and Development |
| OFGEM | Office of Gas & Electricity Markets |
| OFWAT | Economic regulator of the Water Industry |
| PES | Payments for Ecosystem Services |
| PPPP | Project, Policy, Programme and/or Plan |
| ROAMEF Model | Rationale-Objectives-Appraisal-Monitoring-Evaluation-Feedback model |
| SA | Sustainability Appraisal |
| SCBA | Social Cost Benefit Analysis |
| SCCAN | Natural Resources Planning Support System |

| | |
|-----------------|--|
| SEA | Strategic Environmental Assessment |
| SEOs | Strategic Environmental Opportunities |
| SRDP | Scottish Rural Development Programme |
| SROI | Social Return On Investment |
| SWOT | Strengths, Weaknesses, Opportunities and Threats |
| SWW | South West Water |
| TABLES | Tools: Applications, Benefits and Linkages for Ecosystems |
| TEEB | The Economics of Ecosystems and Biodiversity |
| UK NEA | UK National Ecosystem Assessment |
| UK NEAFO | UK National Ecosystem Assessment Follow-on |
| UNESCO | United Nations Educational, Scientific and Cultural Organisation |
| VESL | Valuing Ecosystem Services for Lewes |
| WBCSD | World Business Council for Sustainable Development |
| WRI | World Resources Institute |
| WTA | 'Willingness-to-accept' |
| WTP | 'Willingness-to-pay' |
| WUA | Water User Association |

Key Messages

The UK NEAFO Work Package 10 translates the 12 principles of the Ecosystem Approach¹ into pragmatic advice to enable policy and decision-makers to embed the value of nature within policies and decisions and produce better outcomes for ecosystems and their services. The Ecosystem Approach is currently used in policy and decision-making in a piecemeal fashion, hindering the way nature is embedded into complex resource management issues. Using a policy cycle/decision-making model, a bespoke advice has been developed which uses the 12 principles of the Ecosystem Approach in conjunction with real-life lessons learned from exemplar case studies. The National Ecosystem Approach Toolkit ([NEAT tree](#)) is a publicly available independent web portal/resource that helps decision-makers to engage with the Ecosystem Approach.

Making sense of the diversity and complexity of tools available to help assess risks to, and benefits of, ecosystem services poses a significant challenge for many. The [NEAT Tree](#) helps policy makers and practitioners identify which tool is best suited to a given situation, how it should be used, when it should be used, and in what combination with which other tools. Our functional 'tool typology' helps identify an accessible and integrated suite of tools judged to have high impact and suitability for using the UK NEAFO Ecosystem Services Conceptual Framework; they are structured into categories of regulatory, incentive, valuation, futures, ecosystem services² and participation tools.

Many stakeholders are often unfamiliar with, and confused by, ecosystem terminology, which can hinder engagement with the Ecosystem Approach. Thus, we need to focus ecosystems language towards more recognisable 'hooks'. In the research and policy literature, the UK NEAFO found uncritical use of terms such as the Ecosystem Approach, Ecosystems Assessment, Ecosystem Services Framework and Ecosystem Services Approach³. These terms are currently ill-defined and, so, can be bewildering for many potential user groups, including the 'experts'. In response, a recognisable and generic policy/decision-making cycle is presented by the UK NEAFO: Ideas-Survey-Assess-Plan-Deliver-Evaluate. This offers stakeholders a way to embed the Ecosystem Approach into their policies, plans and projects.

Rethinking the role of nature as producing multiple benefits to society makes ecosystem thinking attractive to different user groups. The UK NEAFO Ecosystem Services Conceptual Framework provides a positive structure within which more holistic considerations of nature can be used in both decision support and incentive schemes, ideally as joined-up bundles. For instance, the use of

¹ The objectives of management of land, water and living resources are a matter of societal choices; 2 Management should be decentralized to the lowest appropriate level; 3 Ecosystem managers should consider the effects (actual or potential) of their activities on adjacent and other ecosystems; 4 There is usually a need to understand and manage the ecosystem in an economic context; 5 Conservation of ecosystem structure and functioning, in order to maintain ecosystem services, should be a priority target of the ecosystem approach; 6 Ecosystem must be managed within the limits of their functioning; 7 The ecosystem approach should be undertaken at the appropriate spatial and temporal scales; 8 Recognizing the varying temporal scales and lag-effects that characterize ecosystem processes, objectives for ecosystem management should be set for the long term; 9 Management must recognize the change is inevitable. 10 The ecosystem approach should seek the appropriate balance between, and integration of, conservation and use of biological diversity; 11 The ecosystem approach should consider all forms of relevant information, including scientific and indigenous and local knowledge, innovations and practices; 12 The ecosystem approach should involve all relevant sectors of society and scientific disciplines.

² Represent tools that also fall into the ecosystem services categories.

³ This term is actually a corruption from the Ecosystem Approach and Ecosystem Services Framework and is therefore academically redundant. However its use is still widespread.

incentives within new market instruments, such as payments for ecosystem services, can help flood management in upland catchments. Equally, regulation can provide important societal and environmental protection where market failure occurs.

Different sectors have particular hooks to enable initial engagement with the Ecosystem Approach and UK NEAFO Ecosystem Services Conceptual Framework.

- For business interests, the hooks revolve around the concept of risk and the delivery of multiple benefits; environmental management systems and corporate social responsibility feature prominently.
- For the built environment, EU Directives (Impact Assessments and the EU Water Framework Directive), together with the National Planning Policy Framework, provide key hooks.
- In local authorities, the Duty to Co-operate (Localism Act 2011) provides a hook for wider engagement in local plan-making where ecosystem services in one administrative area frequently supply consumers, or provide benefits, in another area.
- For local communities, the Localism Act 2011 and Public Services (Social Value) Act 2012 provide hooks, set within asset transfer, community ownership and management goals.
- In the natural environment sector, EU Directives (NATURA 2000) and national policies (e.g. Biodiversity 2020 and Natural Environment White Paper) provide hooks for initial engagement.

Efforts to mainstream ecosystem thinking are enhanced when the ecosystem services framework is used at the outset of policy and decision-making processes. In particular, the Ideas and Survey stages of the NEAT Tree provide a baseline from which evidence can be assessed and used in subsequent stages, hence allowing different trade-offs to be identified and considered. It is important to invest in the Ideas stage in order to identify alternative approaches which can be carried through to the Assess stage and, ultimately, result in a preferred option. Currently, this is rarely done, except where it is mandatory, for example, in Strategic Environmental Assessment.

Our case studies and tool examples reveal the added value that using an Ecosystem Approach can bring:

- (i) The environment represents an 'opportunity space' for providing multiple benefits that support growth, development and quality of life.
- (ii) Many ecosystem services flow across administrative boundaries; therefore, identifying service flows in terms of providers and beneficiaries can facilitate genuine landscape-scale collaborations and new markets (e.g. flood mitigation by investment in upstream land management).
- (iii) Creating markets for undervalued ecosystem services can help to support conservation projects through strong partnerships based on supplier and vendor relationships within new flows of private investment (e.g. Payments for Ecosystem Services [PES]).
- (iv) New partnerships can emerge when the Ecosystem Approach highlights the need for innovation to manage trade-offs (such as the trade-off between food production through intensive agriculture with water quality and biodiversity).
- (v) The Ecosystem Approach provides evidence-enhancing communication about the importance of the natural world to sectors, services and functions which are not usually involved in environmental issues.

Summary

10.S.1 The Project's Scope

Over an 18 month period, the **Tools: Applications, Benefits and Linkages for Ecosystems (TABLES)** project has worked at the interface of research, policy and practice, crossing different disciplines, sectors and professions, to embed the value of nature more effectively into policies, programmes, plans or projects and thus improve decision-making processes and outcomes. Our main focus has been on translating the 12 principles of the Ecosystem Approach into comprehensive advice within which a set of tools can utilise an Ecosystem Services Framework. The interdisciplinary TABLES team, consisting of academics, professionals in practice, community members and policy makers, championed co-production and social learning strategies using member expertise and experience within diverse case studies. These span the environment, business, local community and planning sectors; all of which are trying to mainstream an Ecosystem Approach to some extent.

The project addresses the recommendations of the UK National Ecosystem Assessment (UK NEA, 2011a, 1303) to **integrate ecosystem services and the wider values of the natural environment within a context of policy and decision-making and tools** leading to “a superior basis for future decision-making”.

10.S.1.1 Aim

The principal aim of the project is to mainstream the principles of the Ecosystem Approach through a range of assessment and decision-support tools using an Ecosystem Services Framework in order to improve policy- and decision-making processes and outcomes.

10.S.1.2 Objectives

The findings presented in this report relate to three overarching objectives:

- to champion co-development and co-production of an accessible, user-friendly and valued toolkit for policy-makers and decision-makers that conforms to the principles of the Ecosystem Approach and supports the application of those principles in practice;
- to work across scales (spatial, institutional and temporal) and sectors (environmental, social and economic) to help integrate the Ecosystem Approach into decision-making processes across projects, policies and programmes;
- to work with selected champions across the built and natural environments as exemplar case studies, set within the political and pragmatic realities of policy- and decision-making processes.

Our focus is on identifying and prioritising those tools considered to have most impact in decision-making processes and outcomes within any Project, Policy, Programme and/or Plan (PPPP), and which can then be adapted successfully within an Ecosystem Services Framework. The methodological overview is presented in **Figure 10.1**. However, before undertaking such work there is a need to unpack the key components of ecosystem science and identify the barriers that are hindering progress.

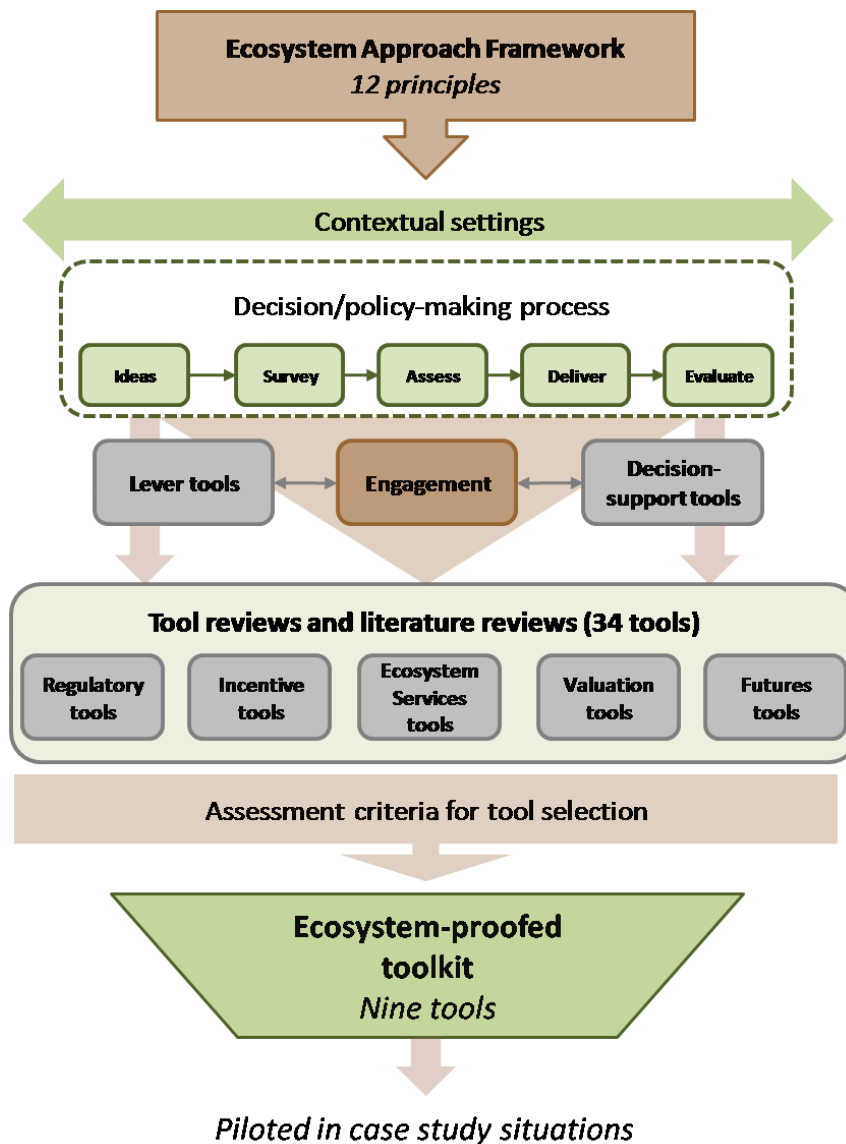


Figure 10.1. Methodological overview.

10.S.2 Ecosystem Science Unpacked

The vocabulary surrounding work on ecosystems needs improved definitional clarity and consistency. During our research, we encountered widespread, uncritical use of the terminology and vocabulary associated with ecosystem science which we found unhelpful: terms such as Ecosystem Services, Ecosystem Approach, Ecosystem Services Framework, Ecosystem Services Approach⁴ and related terms are often used interchangeably and/or without a clear understanding of their meaning, scope and interrelationships. This lack of rigour has hindered efforts to communicate its efficacy and value to decision-makers, both as a new paradigm for integrated land and water management, and its additionality for professional practice. One particular concern is the way the varied conceptions and misconceptions of ecosystem services have come to dominate the policy and decision-making arena, often focusing on selected ecosystem benefits in isolation, divorced from the

⁴ Ecosystem Services Approach is a misnomer and an incorrect conflation of the Ecosystem Approach and the Ecosystem Services Framework.

wider Ecosystem Approach and Ecosystem Services Framework which provide the overall context and define its utility and meaning within the socio-ecological system.

The **Ecosystem Approach** gained prominence with the definition by the Conference of the Parties (COP) on the Convention on Biological Diversity (CBD) in 1995 as “a strategy for the integrated management of land, water and living resources that promotes nature conservation and sustainable use in an equitable way recognising that humans with their cultural diversity are an integral part of ecosystems” (Convention on Biological Diversity, COP 7 Decision VII/11). By definition, the Ecosystem Approach takes into account ecological, economic and social aspects, and places humans as integral components of ecosystems. The application of the Ecosystem Approach is strongly associated with adaptive management and adaptive learning practices but does not preclude other management and conservation approaches. The Ecosystem Approach, therefore, goes beyond ecosystem services *per se* and its proper application can only be achieved through reference to these wider considerations, enshrined in a set of 12 principles commonly termed the Malawi principles (**Table 10.1**).

Table 10.1. The principles of the Ecosystem Approach. (Source: [CBD](#) [accessed 2 May 2012]).

| | |
|----|---|
| 1 | The objectives of management of land, water and living resources are a matter of societal choice. |
| 2 | Management should be decentralized to the lowest appropriate level. |
| 3 | Ecosystem managers should consider the effects (actual or potential) of their activities on adjacent and other ecosystems. |
| 4 | Recognizing potential gains from management, there is usually a need to understand and manage the ecosystem in an economic context. |
| 5 | Conservation of ecosystem structure and functioning, in order to maintain ecosystem services, should be a priority target of the ecosystem approach. |
| 6 | Ecosystem must be managed within the limits of their functioning |
| 7 | The ecosystem approach should be undertaken at the appropriate spatial and temporal scales. |
| 8 | Recognizing the varying temporal scales and lag effects that characterize ecosystem processes, objectives for ecosystem management should be set for the long term. |
| 9 | Management must recognize the change is inevitable. |
| 10 | The ecosystem approach should seek the appropriate balance between, and integration of, conservation and use of biological diversity. |
| 11 | The ecosystem approach should consider all forms of relevant information, including scientific and indigenous and local knowledge, innovations and practices. |
| 12 | The ecosystem approach should involve all relevant sectors of society and scientific disciplines. |

The concept of **ecosystem services** is increasingly used in government policy and across the economic and environment sectors, especially when assessing and valuing environmental benefits at various scales (e.g. the national level, for a region or at the local firm or community scale). This interest has led to the lists of services categorised into functional groups (e.g. supporting, producing, regulating and cultural) **commonly referred to as an Ecosystem Services Framework**. Such groupings can be used as a checklist for the assessment or evaluation of the services provided by nature in a given location. Work by de Groot and others (e.g. de Groot, 1987; de Groot *et al.* 2002) provided the initial classifications that are still drawn on. The term **natural capital** is also increasingly used in ecosystem science, although its definition also includes abiotic resources (e.g. minerals). It provides yet another complex concept, being defined by the Natural Capital committee as “... the elements of nature that produce value or benefits to people (directly and indirectly)”, but also incorporating capacity to produce ecosystem goods and services now and into the future (e.g.

Turner and Daily, 2008). Natural capital thus provides a measure of both current capacity and future potential. To support further detailed analysis, a definition that will be acceptable to all concerned (even if not all encompassing) is suggested in Work Package 1: “A configuration (over time and space) of natural resources and ecological processes, that contributes through its existence and/or in some combination, to human welfare”.

The **Ecosystem Services Framework** highlights the benefits people derive from nature. Rather than focusing on an individual service, the Ecosystem Services Framework is a systemic framework emphasising a system-orientation rather than a service-orientation. As a system, the Ecosystem Services Framework should be applied in totality; not ‘cherry picked’ for one or two services. Doing the latter is likely to produce adverse or perverse outcomes for some ecosystem services (e.g. supporting services) that are rarely articulated or considered but which are fundamental for the overall health and functioning of the environment.

Ecosystem services typology and international ecosystem assessments. The most widely recognised and used scheme for presenting ecosystem services for wider use and assessments is the typology developed by the Millennium Ecosystem Assessment (MA, 2005) which recognises four main categories of service:

- **supporting services** are processes that maintain the integrity, function or resilience of ecosystems and thus are crucial in the delivery of other services (including primary production and long term nutrient cycling);
- **provisioning services** represent the extractable/gained goods and services derived from ecosystems and include food, water, fibre, fuel and genetic material;
- **regulating services** represent the benefits derived from ecosystem functions such as the regulation of flows of water, soil formation and health, air quality and climate; and
- **cultural services** which are the social benefits derived from natural systems, including recreation, tourism, enjoyment of aesthetically pleasing features, and spiritual and artistic inspiration.

Since its publication, the MA scheme has been critiqued and revisions added; for example, the more recent UK National Ecosystem Assessment typology distinguishes between intermediate and final ecosystem services and considers cultural services in their a slightly different way (UK NEA, 2011a). Raffaelli and White (2013) provide a full account of these varied typologies and the commonalities between them.

10.S.3 Championing Co-production of Useful Outputs

Our project champions a co-production philosophy involving a team of academic, policy and practice representatives, working in partnership with individuals who have been implementing the Ecosystem Approach in practice. Set within a social learning dynamic across different settings, our engagement was deliberative, involving a series of one-to-one discussions, workshops and meetings, which allowed us to co-build, co-test and co-refine our tool framework and guidance. We were careful to ensure that our team and selected case studies covered a wide range of interests across the built and natural environment professions including environment, business and community concerns. We highlight the key challenges we faced and our methodological response in **Table 10.2**.

Table 10.2. The TABLES project approach to addressing challenges when applying the Ecosystem Approach and Ecosystem Services Framework in policy and decision-making.

| Challenges | Our Approach |
|--|--|
| Translating academic work on the Ecosystem Services Framework and the Ecosystem Approach | Start from a practice perspective and existing policy base to further develop and infuse academic insights |

| | |
|---|---|
| into workable approaches in policy and practice | |
| Dealing with alienating language caused by using jargon and imprecise use of concepts and terminology | Find common and/or clearer language in communicating |
| Working in disciplinary and professional silos | Use a genuine transdisciplinary approach; work with and establish new fora that bridge different sectors, interests or disciplines |
| Lack of time and resources (austerity measures across publicly funded institutions due to the economic downturn affecting many sectors) | Co-production of knowledge and co-financing of projects and programmes, identifying synergies and common interests |
| Widespread attention and use of ecosystem services where the systemic framework and overarching Ecosystem Approach is seemingly ignored | Work with the Ecosystem Services Framework as the systemic framework and Ecosystem Approach as the guiding principles |
| Bandwagon use of the ecosystems lexicon; manipulation of new terminology to dress up dated existing concepts | Work with champions in selected case studies to highlight what is happening on the ground using social learning and adaptive management approaches |
| Project constraints of pre-set agenda, duration, budget constraints, work package division and timing | Build partnerships and links early on and throughout the process that last beyond the project |
| Conflicting demands from academically or narrowly defined agendas and own defined goals and vision | Build in time and capacity to respond to project-related demands as well as project-related opportunities and innovative pathways; lobby for focus on Ecosystem Approach and the Ecosystem Services Framework rather than individual ecosystem services |
| Working with what is still widely perceived as abstract and vague concepts | Find and use examples and specific tools to demonstrate real applications and potential uses |
| Using the Ecosystem Services Framework and Ecosystem Approach as a bolt-on | Embed the Ecosystem Approach and Ecosystem Services Framework in policies, plans, projects and programmes |

Our response necessarily involves a multi-staged and deliberative process within a transdisciplinary focus (Tress *et al.*, 2005). This actively challenges conventional approaches to research, policy and decision-making in general and the way ecosystem science research has been carried out in particular (see **Table 10.2**). In terms of user-relevant outputs, this process has created specific material outputs as outlined below.

(1) A functional typology of tools - This was presented and justified to help navigate the current complexity of extant tools and toolkits available within the public domain. An initial distinction was made between tools used for decision support (e.g. cost-benefit analysis) and those that influenced people's behaviour (e.g. incentives). From this initial division, a typology was developed based on tool function and scope resulting in the following categories: Futures; Valuation; Incentives; Regulatory; and Public Engagement. In addition, we also identified tools that had been explicitly developed for Ecosystem Services' assessments. For each of these categories, a literature review was undertaken to help the reader understand the scope, contribution and legacy of research and practice.

(2) An integrated suite of tools adapted within an Ecosystem Services Framework - The typology was used as the building blocks for interviews with practitioners and experts to help identify what they perceived as the most influential and valued tools. Thirty-four tools were selected and subjected to a review process, also shaped from respondent interviews, in terms of their perceived

value, impact and ecosystem services' potential. It is recognised that this is a selective exercise with many valuable tools not included. This review process resulted in a final suite of twelve tools which were adapted to incorporate an Ecosystem Services Framework (**Table 10.3**). This was a bespoke process. For some tools, such as Payments for Ecosystem Services (PES) and Cost Benefit Analysis (CBA) guidance has recently been published (e.g. Smith *et al.* 2013⁵; HM Government; 2012) and the Ecosystem Services Framework was already well established, but within our guidance we presented a critique to enable users to appreciate limitations as seen through the wider lens of the Ecosystem Approach. In other cases, such as Strategic Environmental Assessment (SEA), it was necessary for our team members to develop a fresh conceptual and operational approach and procedural guidance.

Table 10.3. The final TABLES suite of tools.

| Ecosystem Services Tools | Incentive Tools | Futures Tools | Regulatory Tools | Valuation Tools |
|---|---------------------------------------|---------------------------------------|---|---|
| Ecosystem Assessment Ecosystem Mapping SCCAN Payments for Ecosystem Services (PES) | Payments for Ecosystem Services (PES) | Backcasting Foresight Visioning | Environmental Impact Analysis (EIA) Strategic Environmental Assessment (SEA) | Corporate Ecosystem Valuation (CEV) Cost Benefit Analysis (CBA) Natural Capital Asset Check |

(3) Bespoke advice and support using the lens of the Ecosystem Approach embedded into a conventional policy cycle model (IDEAS-SURVEY-ASSESS-PLAN-DELIVER-EVALUATE) – This suite of tools (**Table 10.3**) was located within operational guidance built around each stage of an adapted policy cycle model. It is important, however, to realise that this does not capture fully all the 'messiness' inherent in policy and decision-making in the real world. Specifically:

- The model assumes that there is one decision-maker, when in reality many interests and institutions may be involved and it is through the **politics of influence and power** that a particular policy response is shaped.
- The focus on positivism and rationality is challenged by those who argue that politics is not external but a valuable and creative process in which policy-making is a contested sequence of moves and countermoves involving many actors and which leads to the development of **interpretative policy analysis**.
- Policy does not identify and assess an exhaustive list of options; rather it is constrained by the lens of the sectoral interests involved which only allow certain information and data to pass through. This **filtered information** is then analysed and used to make policy and decisions in isolation leading towards poorly integrated policy and unnecessary conflict.
- The implementation phase of the policy cycle requires **participation and endorsement** of key stakeholders but often this is characterised by conflict resolution, compromise, contingency planning, resource mobilisation and adaptation. New policies often reconfigure roles, structures, and incentives, thus changing the array of costs and benefits to implementers, direct beneficiaries and other stakeholders.
- Decision-makers need considerable amounts of information in order to make assessments of all the **available options**, sufficient to be able to predict the consequences of decision options.
- The problems confronting decision-makers often embody **conflicting values**.

Thus our adapted policy cycle tries to address the issues above; most notably through the inclusion of IDEAS and DELIVER phases.

⁵ Smith, S., Rowcroft, P., Everard, M., Couldrick, L., Reed, M., Rogers, H., Quick, T., Eves, C. and White, C. (2013). *Payments for Ecosystem Services: A Best Practice Guide*. London, Defra.

Within each stage of the policy cycle there are key prompts and actions, signposting the most applicable tools to use. The focus on the policy cycle provides a common reference point that the majority of stakeholders working in public policy settings are familiar with or use, in some part, within their operational environments. For each stage, bespoke advice has been created with a checklist of actions to be considered. These are framed within a series of basic questions - WHY? WHAT? WHO? WHEN? WHERE? - from which specific tools are then recommended. A range of case studies of good practice have been documented to augment the information on implementation of tools, providing a reality check of what can be achieved and delivered in practice. These are captured in narratives supplied by key actors of the case studies and video interviews⁶.

(4) All this information and specific material has been brought together in the interactive and independent online web portal: The National Ecosystem Approach Toolkit (NEAT). This web portal not only provides an easily accessible and updatable resource to enable users to engage with and use the key findings in the project but also to engage with the detailed research material on which it was built (through following links in the roots of the tree). This online portal thus hosts an array of important information regarding the project, from video interviews focussing on exemplar case studies to enabling users to explore the various tools which can be used to embed the Ecosystem Services Framework in practice.

Figure 10.2 illustrates our conceptual framework. The policy and decision environment incorporates policies, projects, plans and programmes (PPPP). At the heart of our framework is the Ecosystem Approach and its 12 principles that collectively provide the overarching guide for actions and behaviours at particular stages within the PPPP process (IDEAS-SURVEY-ASSESS-PLAN-DELIVER-EVALUATE). This advice is then applied within our suite of tools used in a range of different settings, scales and sectors to achieve certain goals. The collective memory from these interventions then feed into an improved policy and decision environment where social learning and adaptive management are key ingredients.

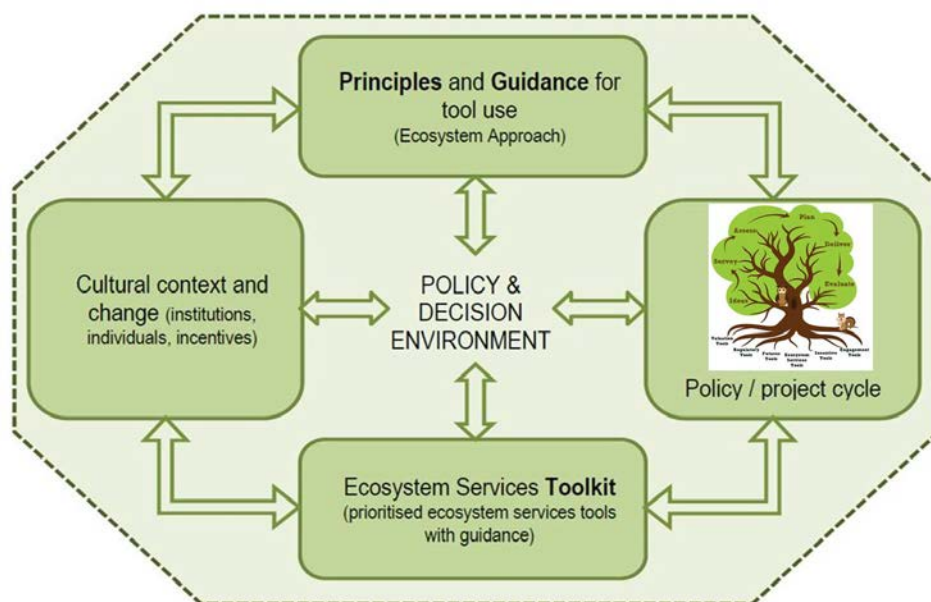


Figure 10.2. The conceptual approach taken by the TABLES project.

10.S.4 Outcomes

⁶ <http://www.eatme-tree.org.uk/studies.html>

The [NEAT](#) Tree serves as the principal output from this research for end users featuring the tools framework, case studies, advice and links to supporting data. From our analysis of different tools and supporting case studies, set within our co-production philosophy, the following key findings emerge.

The Ecosystem Approach provides an important but often overlooked strategic framework to embed nature more effectively into policy and decision-making processes.

Too many tools confuse and hinder effective decision making and policy interventions.

Our guidance helps policymakers and practitioners through a policy cycle model to identify WHAT tool is best suited to a given situation, HOW it should be used, WHEN it should be used, and in COMBINATION with what other tools?

Different stakeholders have different needs and different understandings of the ecosystem vocabulary which necessitates different approaches for engagement.

The key generic hooks arise from a transformative view on nature as an asset producing multiple benefits; the environment becomes an opportunity space to work with rather than try and defeat.

An Ecosystem Services Framework presents a powerful systemic concept but only when used collectively; the use of selected ecosystem services in isolation can lead to perverse effects.

The added value from using the Ecosystem Approach, observed in case studies and tool examples, provides a justification of its value but only demonstrating its real impact and value when used across built and natural environment professions.

10.S.5 Key Areas for future Research

This project has made substantial progress in what represents a major opportunity space for research on the mainstreaming of ecosystem science through the use of a tools framework. As such we have established a framework and supporting advice but this project also highlighted important gaps in evidence and knowledge, particularly relating to the use of the Ecosystem Approach and creating an interactive online toolkit which is approachable for a variety of actors interested in adopting ecosystem science. Future research agendas thus may wish to focus on one or more of the following aspects:

- The tools that comprised our initial tool reviews and final suite were limited due to project resources and time. In particular we recognise the potential of the Community Infrastructure Levy, Tax Incremental Financing and Biodiversity Offsetting as tools for incorporating ecosystem thinking within any further iteration of this project.
- There is significant neglect of equity issues in current ecosystem science research. Research needs to better understand the winners and losers from the current spatial distribution of ecosystem services and the impacts of particular policies such as payments for ecosystem services on social and environmental justice. In particular, there is the need to target interventions in those areas that are most ecosystem service deficient.
- The extent to which policy-making and political decisions across national, subnational (e.g. via Local Enterprise Partnerships) and local government are seriously influenced by the Ecosystem Approach is unclear and thus it would be valuable to assess and monitor emerging policies, programmes, plans and projects to that effect.
- Further research is required to value ecosystem services at the point of consumption of both private and public goods, including the adequate internalisation of how services are produced.

- There is currently little research and clear evidence as to the power relationships between the different ownership models of the assets from which ecosystem services are derived.
- Interventions in habitat and landscape management should be assessed as to where and how these are most effective and able to 'optimise' societal benefits.

10.1 Introduction

The [Tools: Applications Benefits and Linkages for Ecosystems \(TABLES\)](#) project was established to deliver Work Package 10 of the UK [National Ecosystem Assessment Follow-On \(UK NEAFO\)](#) exercise. Our remit stems directly from the recommendations of the UK National Ecosystem Assessment to **integrate ecosystem services and the wider values of the natural environment within a context of policy and decision-making and tools** leading to “a superior basis for future decision-making” (UK NEA 2011a, 1303).

10.1 Mainstreaming the Ecosystem Approach Drawing on the Ecosystem Services Framework

The project aim is to mainstream the Ecosystem Approach in the processes and decisions of projects, policies, plans and programmes (PPPPs) by identifying and adapting the most influential and valued decision-support and assessment tools using an Ecosystem Services Framework⁷. We champion and apply the 12 principles of the Ecosystem Approach as core guidance for actions, tool selection and use within specific stages of a PPPP. Thus the hidden or forgotten value of nature becomes both explicit and integral in the shaping, decision-making and outcomes of PPPPs.

10.1.1 What do we Mean by ‘Tools’?

The term ‘tool’ is problematic due to its vagueness and rather loose interpretations, dependent on users’ background and experience. For example, Sexton (1998) views tools as instruments which help guide and support decision-makers, whilst Petihakis *et al.* (2011) see them as devices which enable greater knowledge exchange between experts and other professionals. It is, therefore, crucial, at the outset, to clarify the way we have conceptualised and defined tools in this work package. Our focus is on tools as delivery vehicles; thus tools cover specific mechanisms or methods that aid, influence or inform PPPP processes and outcomes (TABLES, 2012).

There is, however, a confusing array of tools available in the public domain that are currently used in PPPP formation, delivery and evaluation; each with varying degrees of sophistication, accessibility and transparency. Collectively this poses problems for potential users in terms of knowing the most appropriate tool to select, when to use it and, in conjunction with what other tools, to fulfil a particular goal (Vigerstol and Aukema, 2011). At present the choice of tool is more likely to be based on existing familiarity and knowledge, which can be very limited, rather than through an appreciation of those tools that are most appropriate (Cabinet Office, 2009).

Furthermore, tools are not developed, selected or used in a vacuum. Understanding the socio-economic, political and institutional-cultural spaces and settings⁸ within which tools are used is

⁷ Based on existing literature, definitions for Ecosystems Services Framework can be broadly divided into an assessment-oriented definition and into a governance-oriented definition, with the former seemingly dominant through the work by the Millennium Ecosystem Assessment (2005) and its further iteration in the UK NEA (2011). The assessment related definition relates to a framework of ecosystem services (regulating, provisioning, cultural and supporting) influenced by drivers of change and influencing human wellbeing; whereas the governance related definition, as for example proposed by Turner and Daily (2008), includes attention to policy stages and tool applications within a wider environmental change governance context.

⁸ Settings have been developed in WP4 as cultural spaces; the places, localities, landscapes and seascapes in which people interact with each other and the natural environment”.

important to appreciate their potential for mainstreaming the Ecosystem Approach.⁹ Here, using the ‘plumber analogy’ reminds us that any solution requires the use of various tools in combination and sequence rather than in isolation. This ‘bundling’ of tools is particularly important in addressing what are complex and multi-dimensional challenges associated with the management of the built and natural environment. For example, a Strategic Environmental Assessment of a plan involves multiple stage assessments requiring the development and assessment of alternatives (e.g. scenarios) and assessment of options against criteria (e.g. Cost Benefit Analysis or Multi-Criteria Decision Analysis), set within various stakeholder and public engagement processes to help legitimise the process. If applied properly, this leads to a final plan delivering more robust, resilient and locally-appropriate outcomes (Scott, 2011). Indeed, there is rarely any ‘one-size-fits-all’ tool that provides a magic bullet answer to what are often complex and context-specific problems. Rather, impact is maximised by identifying a suitable bundle and sequencing of tools that collectively address a particular management or policy goal.

In this context, the pursuit of evidence-based policy becomes significant requiring an effective evidence base for the identification, protection and enhancement of ecosystem services. However, many evidence bases are currently not fit for purpose; either through lack of sufficient data or through inappropriate framing within artificial boundaries and jurisdictions (e.g. local authority or sectoral boundaries), as opposed to more natural boundaries within landscape-scale thinking (e.g. Prager *et al.*, 2011). Evidence bases also can remain constrained when captured within a particular sectoral view meaning that many ecosystem services, and connections or dependencies between different ecosystem services, are overlooked.

10.1.2 Devising our Tools Framework

The TABLES project simplifies this tool complexity through the development of a functional and purposive tool typology. From an initial distinction between tools that provide decision-support and those that promote behaviour change, we have identified Futures; Valuation; Incentives; Regulatory, Ecosystem Services and Public Engagement categories. Within each category there are numerous tools available, so we prioritised a suite of tools based on the TABLES research team’s assessment of those tools best-placed, in the current policy and practice context, to both mainstream the Ecosystem Approach and with the highest impact in policy and decision-making processes. This was undertaken through a process of co-production with user-communities in a range of different spaces and settings; from neighbourhood to local authority, to regional to national scales, and across environmental, community and economic sectors. This methodology was vital in securing the necessary stakeholder buy-in, legitimacy and spatial integrity. The production of generic and specific guidance from the Ecosystem Approach was targeted within an adapted policy cycle model which provided familiar territory for potential end-users who engage with PPPs in their work practices. Our adapted stages (IDEAS-SURVEY-ASSESS-PLAN-DELIVER-EVALUATE) all had bespoke guidance highlighting desired actions within which particular tools were signposted. However, we recognise the different needs, motivations and capacities of user communities and we have therefore framed many of our interventions around generic and specific ‘hooks’ and concepts that stakeholders encounter and work with on a daily basis.

Identifying and using these hooks to embed our findings provides a crucial role in ensuring that our research and work is relevant and, most importantly, the outputs (guidance and tools) are used and evaluated. For example, across the built environment professions, where there is a significant deficit in awareness and knowledge of the Ecosystem Approach, we have identified key statutory hooks from the National Planning Policy Framework (DCLG, 2012, par109) which recognises formally the

⁹See individual tool reviews as summarised in **Appendix 4**.

value of ecosystem services; and from the Localism Act 2011 which requires a Duty-to-Cooperate in local plan-making (DCLG, 2011). These policy requirements cover core principles 5 and 6 respectively of the Ecosystem Approach and thus provide important initial traction to engage the built environment professions. For business communities and the private sector, the NPPF also forms an integral part of their operations, Set within additional concepts and language of risk, resilience and multiple benefits, these policy frameworks and laws provide important entry points for engagement regarding the application of ecosystem science in practice.

10.1.3 Building a Conceptual Framework

Figure 10.3 illustrates our conceptual framework. All PPPs and their resulting decisions are developed and used within particular institutional spaces and settings which vary from place to place and from agency to agency. Understanding the setting becomes crucial because agencies operate within their own decision-making environments, but also equally respond to regulatory and incentivised signals, imperatives and dictates from the wider international, national, regional and local policy arenas, as the governance framework demands. From an understanding of that PPPP context, the 12 principles of the Ecosystem Approach then serve as an umbrella within which advice for tool selection and use is translated into the different stages of a policy cycle (IDEAS-SURVEY-ASSESS-PLAN-DELIVER-EVALUATE) as depicted within our [NEAT](#) tree web portal. The advice then helps a user work through a particular PPPP process drawing on an integrated suite of tools that have been subjected to an Ecosystem Services Framework; thus embedding nature explicitly into PPPP processes and outcomes.

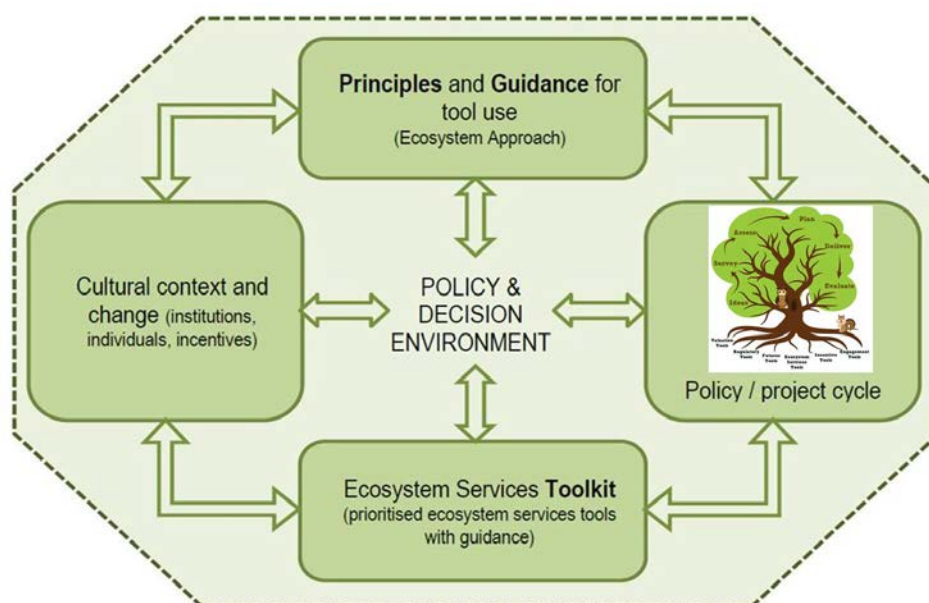


Figure 10.3. Conceptual Framework: Main elements influencing the choice and application of tools to embed the Ecosystem Approach in policy and decision-making.

10.2 Overview of This Chapter

After the articulation of the aims and objectives, the rest of this chapter provides a narrative about the key influences, development, outcomes, products and evaluation of our tools framework. First, we examine the core components of the Ecosystem Approach and its attendant Ecosystem Services Framework from our tools perspective. Second, we assess the history, challenges and opportunities for mainstreaming the Ecosystem Approach in policy and practice. Third, we consider the nature of the policy cycle, within which PPPPs are conceived and the different models developed to explain

the messy reality of policy-making. Collectively this contextual background shapes the fourth consideration, our methodological response which champions a co-production philosophy throughout all stages of the project. Fifth, we highlight the outcomes and products: from the initial tool typology to tool reviews; integrated tool framework; case study exemplars and the independent NEAT tree web portal. This then leads to a more discursive and applied final section that uses the results to develop indicative models of ecosystem mainstreaming and guidance for particular stakeholder groups. Collectively, this generates improved intelligence to identify the added-value and opportunity spaces that an Ecosystem Approach brings to policy and decision-making and targeting the remaining barriers that have yet to be overcome.

10.3 Aim

The principal aim of the project is to mainstream the principles of the Ecosystem Approach in selected public policy tools using an Ecosystem Services Framework to improve the way nature is embedded in policy- and decision-making processes and outcomes.

10.4 Objectives

The project has three overarching objectives:

- to champion co-development and co-production of an accessible, user-friendly and valued toolkit for policy-makers and decision-makers that conforms to the principles of the Ecosystem Approach and supports the application of those principles in practice;
- to work across scales (spatial, institutional and temporal) and sectors (environmental, social and economic) to help integrate the Ecosystem Approach into decision-making processes across projects, policies and programmes; and
- to work with selected champions across the built and natural environments as exemplar case studies, set within the political and pragmatic realities of policy- and decision-making processes.

10.2 Introducing the Ecosystem Approach and Ecosystem Services Framework

10.2.1 Introduction

Ecosystems-science has long influenced research and practice for managing the natural environment (e.g. Likens, 1992; Raffaelli and White, 2013), but has recently gained prominence through the Ecosystem Approach and its attendant Ecosystem Services Framework. Looking at the environment through these lenses allows more holistic and systemic approaches to policy interventions to emerge, mindful of the complex interactions and interdependencies that exist in nature. These approaches allow, in theory, the full consequences, costs and benefits of interventions to be assessed explicitly. Through the lens of Ecosystem Services Framework the natural environment is revealed as a provider of goods and services with multiple environmental and associated human well-being benefits (Baker *et al.*, 2013), challenging traditional ideas of the environment as a constraint to development (Raymond *et al.*, 2013). This more holistic perspective is nationally and internationally relevant, especially at a time when many decisions and policies are predicated upon the primacy of economic growth and where, within that decision mode, the environment can easily become an overlooked externality.

A key strand of research work in this area has been the development of conceptual frameworks with their associated tools to assess and value ecosystem goods and services at a range of scales from global to local (Millennium Ecosystem Assessment, 2005; National Ecosystem Assessment UK, 2011). The resulting Ecosystem Services Framework (Turner and Daily, 2008) has gained prominence and gathered momentum and currency across several sectors, eager to apply to such approaches, and this has often been pursued at the expense of the broader Ecosystem Approach which outlines a set of 12 principles for environmental policies and decision-making (**Box 10.1**). Indeed, as this report argues, there has been a tendency to emphasise ecosystem services *per se* (Principle 5), with the other principles of the Ecosystem Approach, although implicit within an Ecosystem Services Framework, largely overlooked. This is compounded within the literature with differing interpretations of what an Ecosystem Services Framework involves which makes any consensual definition increasingly elusive and contested (Haines-Young and Potschin, 2009; National Ecosystem Assessment, 2011; Simpson, 2011; Turner and Daily, 2008).

Below, we attempt to provide some definitional clarity associated with contemporary ecosystem science and terms and we outline some of the key developments and milestone publications behind these terms outlining their roots, dominant interpretations and current applications.

10.2.2 The Ecosystem Approach

The Ecosystem Approach has been used in various contexts that champion more holistic and integrative perspectives in environmental management and ecology/ecological anthropology research encompassing both biotic and abiotic aspects and processes (Likens, 1992). The Ecosystem Approach adopts a holistic systems perspective which encompasses social and economic concerns such as fairness, inclusive decision-making and longer-term perspectives. Proper adoption of the Ecosystem Approach requires interdisciplinary thinking involving a wide variety of actors (e.g. specialists, stakeholders), knowledge systems and cross-sectoral approaches.

The term Ecosystem Approach gained prominence with the definition by the Conference of the Parties on the Convention on Biological Diversity (CBD) in 1995 as:

“a strategy for the integrated management of land, water and living resources that promotes nature conservation and sustainable use in an equitable way recognising that humans with their cultural diversity are an integral part of ecosystems” (Convention on Biological Diversity, COP 7 Decision VII/11).

By definition, the Ecosystem Approach takes into account ecological, economic and social aspects, and places humans as integral components of ecosystems. The application of the Ecosystem Approach is strongly associated with adaptive management and adaptive learning practices but does not preclude other management and conservation approaches. Indeed, integration is essential to deal with complex situations (Stadler, 2002). Additionally, unlike terms such as ‘habitat’, ‘biome’ or ‘ecological zone’, the Ecosystem Approach is not scale-bound; instead “the scale of analysis and action should be determined by the issue being addressed” (Stadler, 2002, p.25). Similarly, the time scale to be considered may encompass decades, centuries or millennia. Furthermore, there is an associated shift away from specific species to whole landscape considerations and from a focus on researching organisms to assessing functional relationships and interdependencies.

The 12 principles defined by the CBD are complementary and interlinked (see **Box 10.1**) and have been used as a starting point for national and devolved governments in the UK to formulate their own set of principles.

Box 10.1. The Ecosystem Approach Principles as defined by the Convention on Biological Diversity.

- 1 The objectives of management of land, water and living resources are a matter of societal choices.
- 2 Management should be decentralized to the lowest appropriate level.
- 3 Ecosystem managers should consider the effects (actual or potential) of their activities on adjacent and other ecosystems.
- 4 Recognizing potential gains from management, there is usually a need to understand and manage the ecosystem in an economic context.
- 5 Conservation of ecosystem structure and functioning, in order to maintain ecosystem services, should be a priority target of the ecosystem approach.
- 6 Ecosystem must be managed within the limits of their functioning.
- 7 The ecosystem approach should be undertaken at the appropriate spatial and temporal scales.
- 8 Recognizing the varying temporal scales and lag-effects that characterize ecosystem processes, objectives for ecosystem management should be set for the long term.
- 9 Management must recognize the change is inevitable.
- 10 The ecosystem approach should seek the appropriate balance between, and integration of, conservation and use of biological diversity.
- 11 The ecosystem approach should consider all forms of relevant information, including scientific

and indigenous and local knowledge, innovations and practices.

12 The ecosystem approach should involve all relevant sectors of society and scientific disciplines.

For example, Defra’s (2010) *Delivering a Healthy Natural Environment* document condensed the 12 principles to a set of five, focusing on holism, ecosystem services in decision-making, respecting environmental limits, considering different scales and cumulative impacts, and applying adaptive management. In a follow-on Defra study, *Embedding an Ecosystems Approach in Decision Making*, a sixth principle was added; the engagement of stakeholders in decision- and plan-making with the fifth principle was slightly reworded (Potschin *et al.*, 2011; see **Box 10.2**).

Box 10.2. Defra’s adaptation of the Ecosystem Approach Principles. (Potschin *et al.* 2011)

- 1 Taking a more holistic approach to policy-making and delivery, with the focus on maintaining healthy ecosystems and ecosystem services
- 2 Ensuring that the value of ecosystem services, are fully reflected in decision-making
- 3 Ensuring that environmental limits are respected in the context of sustainable development, taking into account ecosystem functioning
- 4 Taking decisions at the appropriate spatial scale, while recognising the cumulative impacts of decisions
- 5 Promoting adaptive management of the natural environment to respond to changing pressures, including climate change
- 6 Identifying and involving all relevant stakeholders in the decision and plan making process

The Scottish Government also formulated its own separate principles to implement the Ecosystem Approach in their land use strategy in 2011, grouping key aspects around three core themes: considering natural systems, taking account of ecosystem services, and involving people. Each point is explained with examples and the first and second principles also accommodate some aspects of the other original CBD principles (see **Box 10.3**).

Interestingly, the Welsh Government’s approach has been targeted through their work in establishing the remit and focus of Natural Resources Wales (NRW)¹⁰, within which the Ecosystem Approach has been adapted as a framework for NRW staff in carrying out their work priorities and tasks. Significantly the draft framework uses all of the original 12 CBD principles within a modified policy cycle (**Figure 10.4**).

Box 10.3. The Scottish Government’s adaptation of the Ecosystem Approach Principles. (Scottish Government, 2011, p.2)

- 1 **Consider natural systems** – by using knowledge of interactions in nature and how ecosystems function. For example - how changing water temperature affects fish species; how grazing animals or fertilizing crops changes the balance of plant species; or how species interact

¹⁰ Natural Resources Wales came into being on 1 April 2013 and was the result of a merger for the Forest Enterprise, countryside Council for Wales and the Environment Agency.

through competition and predation. This implies a need to consider the broad scale as well as the local; and the long-term as well as the immediate. Ecosystem function often shows a capacity to accommodate some change, but a significant impact may result when a threshold is crossed and capacity exceeded.

2 **Take account of the services that ecosystems provide** – including those that underpin social and economic well-being, such as flood and climate regulation, resources for food, fibre or fuel, or for recreation, culture and quality of life. For example:

- The likelihood of floods affecting people's homes depends in part on how the land is used in the surrounding catchment
- Everyone's food resources depend on clean water and productive soils
- Our quality of life is enhanced by pleasant surroundings for work and leisure

All these services are supplied by our ecosystems. There are ways to account for some of these services using economic and other measures to inform policy and consider offsetting or mitigation.

3 **Involve people** – those who benefit from the ecosystem services and those managing them need to be involved in decisions that affect them. Their knowledge will often be central to success. Public participation should go beyond consultation to become real involvement in decision-making. Taking a more holistic approach to policy-making and delivery, with the focus on maintaining healthy ecosystems and ecosystem services.

So, although each of the UK devolved administrations has developed their own framework for the Ecosystem Approach, there are common themes emerging; holism, ecosystem services, environmental limits, scalar flexibility, collaboration and inclusion. Possibly the strongest generic feature is, however, the reference to ecosystem services (Principle 5) which is the primary currency in research and policy discussions and outcomes. For example, ecosystem services are always represented in the condensed/adapted lists (see **Boxes 10.2 and 10.3**); and the concept appears to have more political and economic sector traction and appeal than the overarching Ecosystem Approach. Thus attention is paid in the following subsection to the influences, evolution and attraction of ecosystem services and the Ecosystem Services Framework.

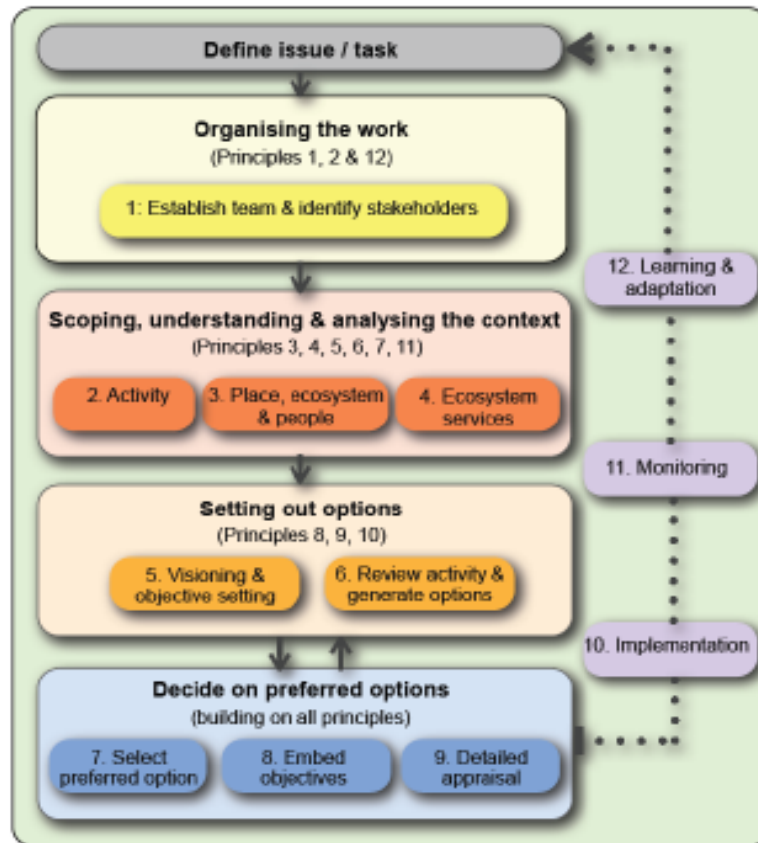


Figure 10.4. The Ecosystem Approach in the Policy Cycle of Natural Resources Wales.

10.2.3 The Ecosystem Services Framework and its Use in Ecosystem Assessments

The concept of ecosystem services is now common currency in government policy and across the environment sector especially in terms of assessing and valuing environmental benefits at various scales (e.g. the national level, for a region or at the local firm or community scale). This interest has led to lists of services grouped by common characteristics. Such lists can be used as a checklist for the assessment or evaluation of the services provided by a given location (e.g. de Groot, 1987; de Groot *et al.*, 2002).

Alongside ecosystem services, the term natural capital is also increasingly used, although its definition also includes abiotic resources (e.g. minerals). It provides yet another complex concept, being defined by the Natural Capital Committee as ‘... the elements of nature that produce value or benefits to people (directly and indirectly), ...’ but also incorporating capacity to produce ecosystem goods and services now and into the future (e.g. Turner and Daily, 2008). Natural capital thus provides a measure of both current capacity and future potential. The WP 1 report defines it as “a configuration (over time and space) of natural resources and ecological processes, that contributes through its existence and/or in some combination, to human welfare”.

The UN’s Millennium Ecosystem Assessment (MA, 2005), a global scale assessment of the status and trends of the planet’s major habitat types and the prognosis for human well-being based on ecosystem service production, highlighted this direct linkage between natural capital and services, and has also provided a typology of ecosystem services. The cycle of interrelationships and linkages between these services and well-being is captured in Ecosystem Services Frameworks, such as the one proposed by Turner and Daily (1998) (see **Figure 10.5**) which recognises its potential explicitly in

policy and decision-making contexts and which acknowledges and includes linkages to several of the 12 principles.

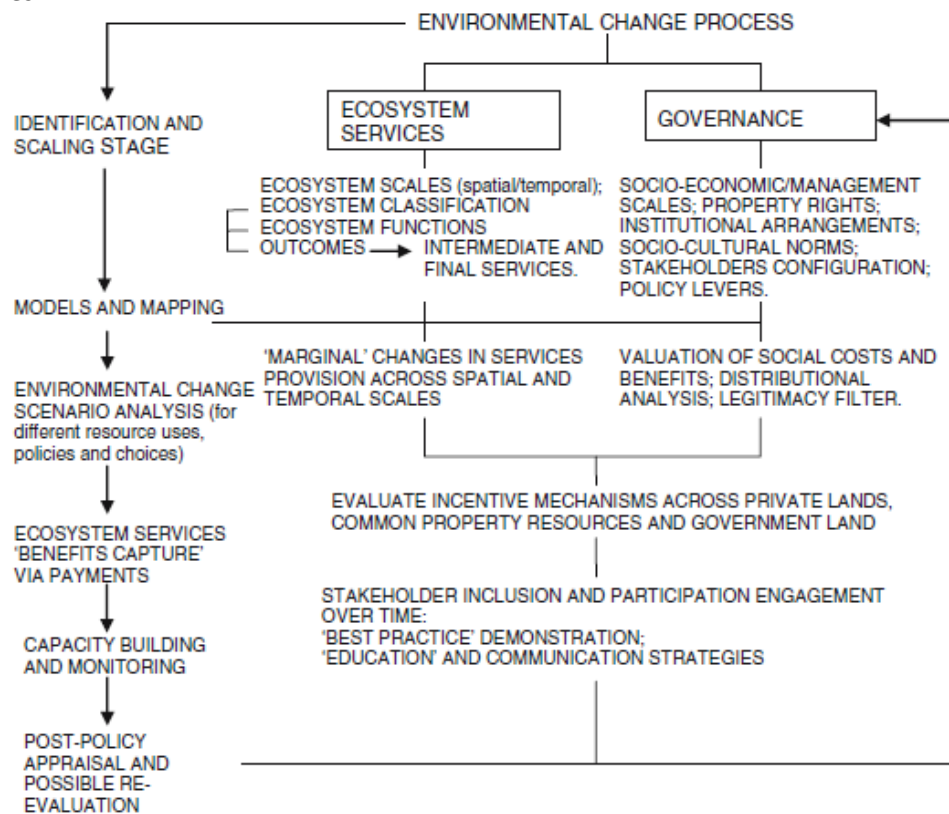


Figure 10.5. The Ecosystem Services Framework according to Turner and Daily (2008: 27).

10.2.3.1 Ecosystem Services Typology and International Ecosystem Assessments

The most influential work on presenting ecosystem services for wider use and assessments is the typology developed and used by the Millennium Ecosystem Assessment (MA, 2005). Their classification is the most widely recognised and used starting point to describe ecosystem services (e.g. CICES, 2011). The typology recognises four main categories of services:

1. **supporting services** represent long term ecosystem functions that support the delivery of other services (including primary production and long term nutrient cycling);
2. **provisioning services** represent the goods derived from ecosystems and include food, water, fibre and fuel;
3. **regulating services** represent the benefits derived from ecosystem functions such as the regulation of flows of water and soil and climate; and
4. **cultural services** which are the social benefits derived from natural systems, including recreation and enjoyment of aesthetically pleasing features.

Whilst this typology and associated assessment framework is widely applied, there are modifications proposed to help address criticisms relating to inconsistencies between service categories and overlap resulting in double accounting when valuing ecosystem services (Wallace, 2007; Boyd and Banzhaf, 2007) and difficulties with its application for practical management (Armsworth *et al.*, 2007). More recent typologies (Fisher and Turner, 2008; Haines-Young and Potschin, 2009; Fisher *et al.*, 2009; Morse-Jones *et al.*, 2011) distinguish between stocks of natural capital (encompassing landscape structure and function), the flows of services and the benefits derived (see **Figure 10.6**).

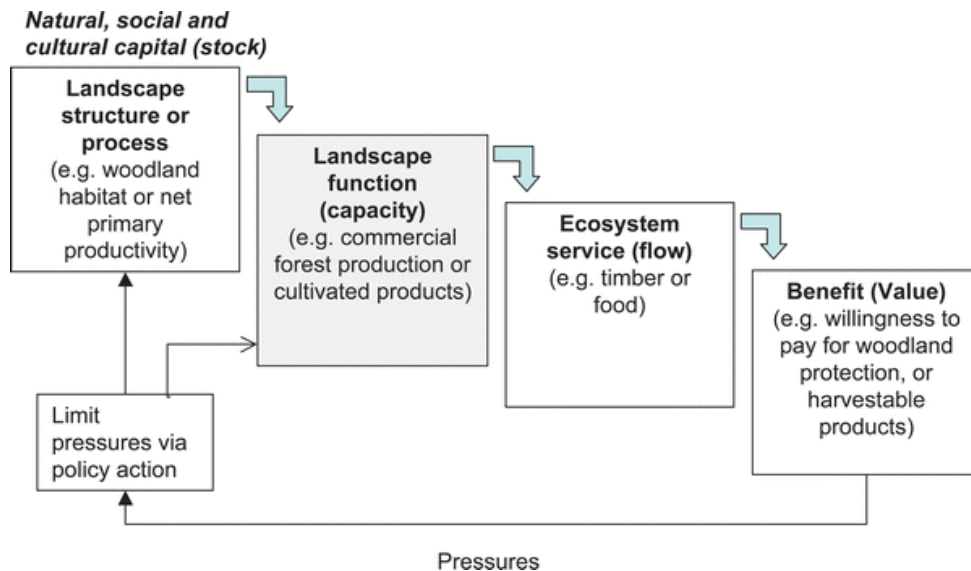


Figure 10.6. Conceptual Framework for analysing Landscape Functions. (Source: Pagella, 2011: Figure 1, p.9; based on Kienast *et al.*, 2009 and Haines-Young and Potschin, 2009)

Several studies have called for more spatially explicit typologies (e.g. Boumans and Constanza, 2007; Fisher *et al.*, 2009) and an updated, more universally accepted typology for ecosystem services (Fisher *et al.*, 2009; Morse-Jones *et al.*, 2011). Despite its limitations, the MA typology has been widely used as the baseline typology for subsequent national, regional and local assessments.

10.2.4 National Ecosystem Assessments

Assessment of the state or health of ecosystems conducted at a global level by the MA (2005) inspired the translation of such assessment to a national scale, as undertaken by the UK (UK NEA, 2011a, b), Portugal (EME, 2011), Spain, Switzerland, Germany and Norway (e.g. Hails and Omerod, 2013). Embedding the Ecosystem Approach within the UK has been influenced strongly by research commissioned by Defra (e.g. Haines-Young and Potschin, 2008; Potschin *et al.*, 2011; Smart *et al.*, 2012) and several of their guidance documents (e.g. Defra, 2007a, b; Defra, 2010a, b). For example, the UK National Ecosystem Assessment (UK NEA, 2011a) typology uses the four-fold division of ecosystem services but also added a distinction between whether services were final or intermediate processes (see **Figure 10.7**). Also, the overarching conceptual framework for the UK NEA (see **Figure 10.8**) builds closely on the work of the MA (2005), along with post-MA reviews such as Carpenter *et al.* (2009), The Economics of Ecosystems and Biodiversity's (TEEB) Scoping the Science report (Balmford *et al.*, 2008), Fisher *et al.* (2008) and the European Academies Science Advisory Council's (EASAC) 2009 policy report.

Despite significant challenges in assessing ecosystems and some ecosystem services, the UK National Ecosystem Assessment represented the first comprehensive analysis of the value provided to society by its natural environment (UK NEA, 2011a, b), and was one of the first national ecosystem assessments beyond the sub-global (national) assessments as part of the Millennium Ecosystem Assessment. It assessed the status and trends of the UK's ecosystems and the services they provide at multiple spatial scales, identifying key drivers of change and testing their impacts using plausible future scenarios. This enabled considerations of policy and societal response options to secure the delivery of ecosystem services into the future. A large part of the assessment specifically focused on identifying and, as far as possible, quantifying the value of ecosystem services' contribution to human well-being through both economic and non-economic analyses. The UK NEA divided the economic analyses for ecosystem services assessment into two types: (i) sustainability analyses, assessing stocks of natural assets; and (ii) programme evaluation analyses, seeking to determine the value of the flow of services provided by these natural assets. Both types of analyses were found

useful, the former to inform macro-level policy, and the latter to support economic calculations of Payment for Ecosystem Services (UK NEA, 2011a, p.1071).

Table 2.2 Ecosystem services in the UK NEA classified according to both ecosystem service type (provisioning, regulating, cultural and supporting) and whether or not they are final ecosystem services or intermediate services and/or processes. For each final ecosystem service an example of the good(s) it delivers is provided in italics.

| Ecosystem processes/intermediate services | | Final ecosystem services (example of goods) | |
|---|--|---|---|
| Supporting services | <ul style="list-style-type: none"> • Primary production • Soil formation • Nutrient cycling • Water cycling | Provisioning services | <ul style="list-style-type: none"> • Crops, livestock, fish (<i>food</i>) • Trees, standing vegetation, peat (<i>fibre, energy, carbon sequestration</i>) • Water supply (<i>domestic and industrial water</i>) • Wild species diversity (<i>bioprospecting, medicinal plants</i>) |
| | | Cultural services | <ul style="list-style-type: none"> • Wild species diversity (<i>recreation</i>) • Environmental settings (<i>recreation, tourism, spiritual/religious</i>) |
| | <ul style="list-style-type: none"> • Decomposition • Weathering • Climate regulation • Pollination • Disease and pest regulation • Ecological interactions • Evolutionary processes • Wild species diversity | Regulating services | <ul style="list-style-type: none"> • Climate regulation (<i>equable climate</i>) • Pollination • Detoxification and purification in soils, air and water (<i>pollution control</i>) • Hazard regulation (<i>erosion control, flood control</i>) • Noise regulation (<i>noise control</i>) • Disease and pest regulation (<i>disease and pest control</i>) |

Figure 10.7. Ecosystem services classification used by the UK National Ecosystem Assessment. Source: UK NEA 2011b: 17.

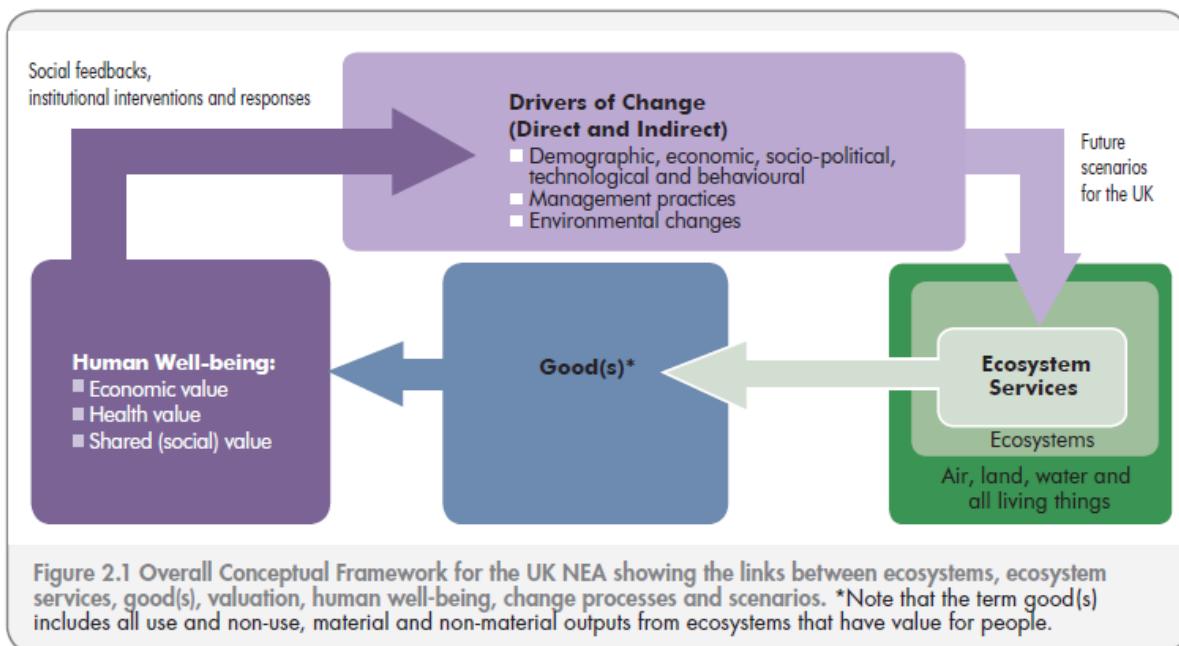


Figure 10.8. The Conceptual Framework for the UK National Ecosystem Assessment. Source: UK NEA 2011:17.

10.3. Mainstreaming Ecosystem Science

10.3.1 Introduction

Whilst there are limited evaluations of mainstreaming efforts concerning the Ecosystem Approach in general, Karjalainen *et al.* (2013) argue that the Ecosystem Services Framework is now beginning to feature routinely in environmental policy and decision-making within a UK context. For example, the UK NEA (2011a) acted as a catalyst for the development of a government White Paper '*The Natural Choice: Securing the Value of Nature*' (HM Government, 2011); the first paper on the natural environment for some 20 years. In its foreword, *The Natural Choice* recognises the importance of mainstreaming ecosystem services.

"Too often, we take for granted the goods, services and amenity value that nature freely provides us. They risk being lost as a consequence. We can and we must do things differently. With a new way of thinking we can nurture them. [...]" (HM Government, 2011: Foreword)

It is, therefore, highly significant that *The Natural Choice* was an HM Government-wide publication requiring all government departments to sign up to a commitment to integrate the values of nature into the mainstream of policy and practice. The principal action plan emerging from the White Paper was Biodiversity 2020 (Defra, 2011), but in parallel the government also set up a Natural Capital Committee and Ecosystem Markets Task Force, both helping to mainstream ecosystem science primarily through the lens of the Ecosystem Services Framework (Defra, 2011).

Despite this wider commitment, the mainstreaming of the Ecosystem Services Framework within the UK, and its devolved decision-making contexts, appears to remain driven largely by environmental and economic interests, with a focus of work and delivery towards the natural environmental sector and its supporting agencies. By contrast, a large majority of the built environment sector; transport, energy, construction, estate management, planning and their associated professions remain largely unaware of this work and related publications in general, and of the Ecosystem Services Framework in particular, albeit with the notable exception of work in green infrastructure (e.g. Scott *et al.*, 2013). In part this is due to the perception that ecosystem services are merely about 'environmental issues', external to the interests of other sectors of society (Scott *et al.*, 2013). Thus Maltby *et al.* (2013: 131) argue for more integrated approaches based on bridging disciplinary and sectoral interpretation of ecosystem services for cross-compliance between formerly discrete policy areas. Indeed, the UK NEA (2011a) highlighted the need for multiple actors to work together in new partnerships for the Ecosystem Assessment, and associated concepts, to maximise mainstreaming potential.

Despite this critique, much positive progress has been made using the lens of the Ecosystem Services Framework in both theory and practice (Farley and Constanza, 2010; Rodriguez *et al.*, 2006). For example, its use and application within the UK National Ecosystem Assessment and in Payments for Ecosystem Services schemes (Smith *et al.*, 2013). Here advances in economic valuation techniques provide potential for the realisation of new environmental markets with emerging tools under development such as the Community Infrastructure Levy, Tax Incremental Financing and Biodiversity Offsetting schemes offering potentially exciting opportunities that need further critical exploration. These advances in thinking, science and application have led to a global explosion in research and development programmes with complex and diverse models and associated tools to further ecosystem services' primacy (Bagstad *et al.*, 2013; Opera, 2013). Their explicit inclusion in the National Planning Policy Framework (DCLG, 2012, par. 109), Natural Environment White Paper

Securing the Value of Nature (HM Government, 2011) and the UK Sustainability Development Strategy (Defra, 2011), confirm that ecosystem science and lexicon is starting to pervade, albeit slowly, across different government departments. However, this has led to some concerns that the ecosystems agenda is being pursued within too narrow an anthropogenic and utilitarian conception of environmentalism, lacking explicit attention to issues of power, justice, complexity, capacity and context (Spash, 2008; O'Neill, 2001) resulting in little actual change in terms of environmental and, by implication, long-term social and economic outcomes.

10.3.2 Ecosystem Services: a Chronological Perspective

Baggeth et al. (2012) trace the use of the term ecosystem 'services' back to the 1970s in connection with scientific theory that emphasised society's dependence on ecosystems for its well-being and future survival. Early influential work stems from ecologists (e.g. de Groot, 1987; de Groot et al., 2002; Daily, 1997) and environmental and ecological economists (e.g. Georgescu-Roegen, 1971; Costanza and Daly, 1992; Costanza et al., 1997). Here, a link was recognised between deterioration in environmental quality/health and insular working practices between disciplines and sectors. Collaboration amongst ecologists, economists, conservationists, planners and decision-makers was weak (de Groot, 1987), hampered by the lack of a common language across multiple disciplines (Scott et al., 2013). Consequently, there has been a spurt of ecosystem services publications in the ecological economic and sustainability literature during the 1990s. Over the past decade the concept has also pushed into policy documents and legislation. Key influential work and key stages in the evolution of ecosystem services from research into policy agendas are highlighted in **Figure 10.9**.

As evident in the terms of ecosystem 'goods and services', the ecosystems services concept is critically informed by economic thought and theory. This extends now into policy and decision-making where there is a bias to present the value of non-human nature - our 'environmental assets' or 'natural capital' - with attempts to quantify these in monetary terms, largely through cost-benefit analyses, so that ecosystems may be better taken account of in decision-making processes. This 'neoclassical' approach is, however, strongly opposed by those who pursue and lobby for more holistic and ethical bases in mainstreaming ecosystems thinking with the explicit consideration of environmental and social justice (e.g. Jax et al., 2013; Dempsey and Robertson, 2012; Spash, 2010; Norgaard, 2010; Daily et al., 2009).

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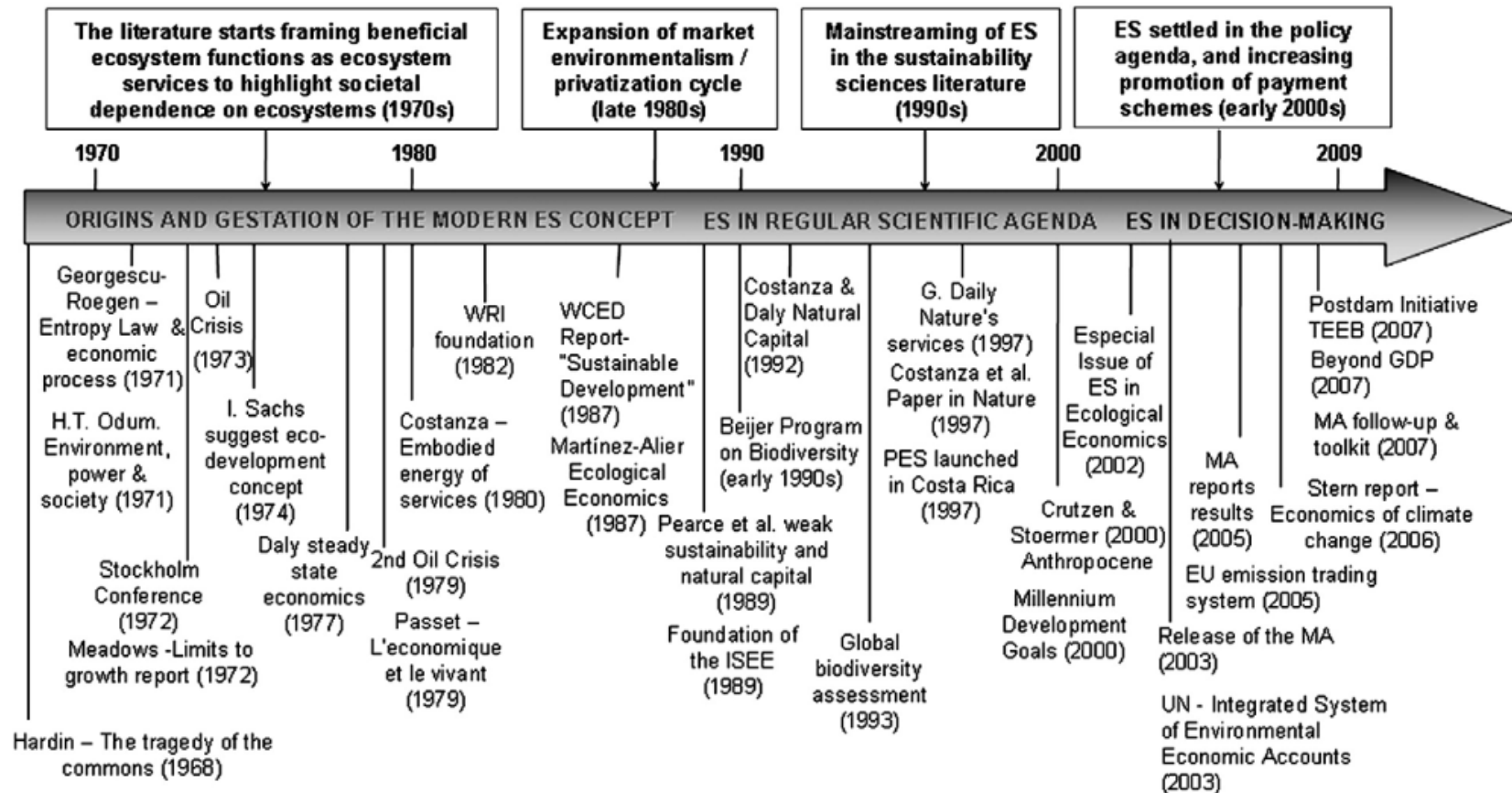


Figure 10.9. Stages in the modern history of mainstreaming ecosystem services. (Source: Gomez-Baggethun et al. 2010, p.1213. Reprinted with permission from Elsevier).

10.3.3 Mainstreaming Efforts: Embedding the Ecosystem Services Framework in Policy and Practice

Luck *et al.* (2012) provide an authoritative account of the principal ways the ecosystem services concept has been mainstreamed in policy and practice. First, within new environmental markets from payments for ecosystem service programs (e.g. Engel *et al.*, 2008). Second, within multi-criteria assessments to inform strategic policy guidance and priority setting (e.g. Nelson *et al.*, 2009). Third, within green accounting methods (e.g. World Bank, 2011) and, finally, as a communication tool, revealing the importance of ecosystems and biodiversity to human well-being (Luck *et al.*, 2012). These have then been applied at a variety of scales which are now briefly reviewed.

At the global level there has been significant work and achievements in developing and embedding the Ecosystem Services Framework in policy and practice. The most notable development was the publication of the Millennium Ecosystem Assessment (2005) which presented a unifying definition and classification of ecosystem services leading to a succession of publications for the translation of ecosystem services into wider decision making frameworks as well as influencing subsequent national Ecosystem Assessments.

In 2007, environment ministers from the G8+5 countries met in Potsdam initiating the analysis of the global economic benefit of biological diversity. This led to an influential report [The Economics of Ecosystems and Biodiversity](#) (TEEB, 2008). Of particular relevance to mainstreaming efforts was the way that subsequently targeted reports were produced (TEEB, 2010 a, b, c, d) for different audiences (ecological economics, national and international policy making, local and regional policy and business and enterprise).

Other global mainstreaming efforts revolved around the World Resource Institute which works with governments to embed ecosystem thinking into wider economic growth strategies. Their strategy is to provide decision-makers with information and assessment tools that link ecosystem health with the attainment of economic and social goals; and develop new markets and economic incentives (WRI, 2013). Of particular interest here is the [Corporate Ecosystems Services Review](#) with an emphasis on how businesses can incorporate ecosystem services into their performance systems and more latterly with their guide for embedding [ecosystem services into impact assessments](#).

Research case studies from the Ecosystem Services Poverty Alleviation (ESPA) programme also highlight the global opportunity space for mainstreaming ecosystem services. For example, the world's first [carbon credit scheme for mangroves](#) was developed together with projects that pay particular attention to [trade-offs and environmental and social justice](#) in ecosystem management. There are also important networks of experience and practice emerging which represents a key first step in mainstreaming efforts. The IUCN has also been a key champion of using the ecosystem approach through its work on marine and upland environments where, for example, a [draft peatland code](#) has been developed.

Within the European Union there has been a significant policy shift towards more ecosystem-based science with the adaptation of several environmental directives, strategies, recommendations and agreements. This has necessitated the integration and communication of economic, ecological, hydrological, and other processes across spatial and temporal scales to improve regulatory tools and decision making processes.

The [EU Biodiversity Strategy 2020](#) provides the principal implementation plan for the delivery of ecosystem services. Action 5 calls upon member states to map and assess the state of ecosystems and their services in their national territory with the assistance of the European Commission. As a result guidance and approaches are being developed and explained (e.g. Maes *et al.*, 2013) informing the development of a wide range of tools, policies and programmes for managing built and natural environments

Of particular interest is the current focus on the Environmental Impact Assessment Directive (85/337/EEC) for mainstreaming efforts using the lens of the Ecosystem Services Framework. Proposed amendment to the Directive (2011/92/EU) suggests that 'biodiversity and ecosystem services it provides' replaces the existing topic of 'Flora and Fauna' (Baker *et al.*, 2013). Whilst not as formalized as the EIA Directive, Spray and Blackstock (2013) have undertaken an assessment of how an Ecosystem Services Framework can be incorporated into the Water Framework Directive through River Basin Management Planning, whilst De Hartje and Klaphake (2013) focus more on freshwater habitats as part of the [Water Framework Directive](#). Ecosystem-based approaches have also been linked to the Common Fisheries Policy and guidelines produced for implementing an ecosystem approach in [marine policy](#) within the PISCES programme.

At the UK national level agencies are embedding the Ecosystem Services Framework largely through Defra's lead. For several years, Defra aimed to not merely influence new policy, but also to retrofit existing policy to include elements of the Ecosystem Approach (Defra, 2010). Nevertheless, Potschin *et al.* (2011) argue that there is a need to provide extensive examples and evidence of use together with a demonstration of added-value and benefits to support mainstreaming efforts. From the literature we have reviewed in this section these may be summarised as follows:

- The Ecosystems Services Framework can be conducted at a variety of scales; from the small scale (e.g. soil surveys) through to global ecosystems (international assessments such as the Millennium Ecosystem Assessment). The most-appropriate scale will be determined by the problem/ ecosystem service being addressed (Keshkamat *et al.*, 2012).
- The Ecosystems Services Framework, in theory, allows trade-offs to be identified and accounted for using valuation techniques enabling hidden values and benefits of particular strategies to be made explicit and thus different associated alternatives to become 'viable' within existing institutional contexts.
- The Ecosystems Services Framework supports the assessment of cumulative effects. Cumulative effects are highly problematic in current resource management issues and have in the past been poorly dealt with (Baker *et al.*, 2013; Adams *et al.*, in press).
- The Ecosystems Services Framework is not a replacement for other approaches that are used by bodies and agencies in resource management problems (e.g. Spatial Planning; Building Information Modelling; Landscape Ecology); rather it complements and improves such thinking in resulting strategies (Egoh *et al.*, 2007; Yin and Zhao, 2012).
- The Ecosystems Services Framework can take a long term approach which creates greater certainty for investment because more complex and longer term outcomes are clearer and agreed from the start.
- The Ecosystems Services Framework can be retrofitted on to existing plans and policies as part of a wider ecosystem servicing process. Thus plans can incorporate an Ecosystem Services Framework as part of review procedures to help the evolution of such plans. The Heysham Link road Environmental Impact Assessment provides a good example of this approach (Defra, 2009).

Significantly, Defra (2013) argue that spatial planning can help to facilitate and improve the protection and management of ecosystem services as also recognised in the NPPF (DCLG, 2012). Recent mainstreaming work from the Natural Environment White Paper (2011) includes a focus on the Ecosystem Services Framework where particular attention has been placed on new market

based instruments such as Payments for Ecosystem Services (PES) schemes and biodiversity offsetting.

Indeed, Defra has published contemporary guidance on PES where the beneficiaries, or users, of ecosystem services provide payment to the ecosystem service providers (Smith *et al.*, 2013: 13). In its most fundamental form, PES involves encouraging key decision-makers to work with those maintaining or providing environmental services at the landscape-scale. Here Defra highlight the value of Geographic Information Systems (GIS) tools, such as InVEST, as mechanisms which can facilitate the mainstreaming of the concept through the use of mapping and modelling to help inform future PPPPs.

Biodiversity offsetting provides a potential link between planning application delivery and ecosystem services. Here acceptable damage to the environment in one area is offset through the extension or improvement of existing sites or the creation of new nature sites, elsewhere (Johst *et al.*, 2012). In most instances biodiversity offsetting only accounts for the structural features of a habitat. This is driven by the current Defra metric which focuses on habitat size, type and condition only.

However, there are indications that within England the ecosystem services functions of sites are being accounted for within some off-site compensation discussions. In particular some local planning authorities are looking at including ecosystem services related to visual landscape, water retention and recreation or access within their off-site compensation policies. Where this is being done it is not necessarily framed in ecosystem services typology. Concerns about biodiversity offsetting as a tool exist, particularly around social equity (see e.g. Dempsey and Robertson, 2012). The inclusion of ecosystem services within this tool has the potential to make explicit the costs and benefits of moving areas of greenspace and related ecosystem services from one area to another. The main barrier to including ecosystem services within off-site compensation is concerns that including ecosystem services (implicitly and explicitly) brings an additional level of complexity and burden for developers; hence in most cases within the current policy framework it is unlikely that ecosystem services will be included. However, the fact that a number of local planning authorities are deciding unilaterally to use the concepts of ecosystem services within their off-site compensation policies suggests that there is value in its inclusion. This is an evolving policy area and it is unclear currently whether biodiversity offsetting will be an avenue through which an Ecosystem Services Framework becomes mainstreamed into planning policy and delivery, but the potential is clearly there.

The Ecosystem Markets Task Force is a think-tank across government, policy, practice and academia. It published its final report in 2013 entitled [Realising Nature's Value](#) (Defra, 2013) which adopted a risk-based business case for why nature matters. By drawing on a range of best practice examples, it makes practical recommendations for both Government and business with a focus on the creation and development of new environmental markets that enhance opportunities for economic growth. In a similar vein, the Natural Capital Committee illustrates the kind of cross sector partnerships that are now being created where an Ecosystem Services Framework is being mainstreamed in thinking and policy development.

In **Wales** and **Scotland** there have been separate initiatives through the devolved government bodies and their supporting agencies on mainstreaming the ecosystem approach. In **Wales**, as part of the [Living Wales Programme](#) (Welsh Assembly Government, 2013), a framework has been developed embedding the Ecosystem Approach explicitly for programmes of work, set within the newly established body Natural Resources Wales. This represents, by far, the most comprehensive attempt thus far to mainstream the Ecosystem Approach in the UK context. However, it still sits within a natural environment framing and has yet to engage fully with built environment interests. It is, however, exciting to note how the use of mapping multiple ecosystem services has been

integrated into some development plans with Bridgend and Port Talbot providing the first notable examples of ecosystem services in planning policy, using the [SCCAN](#) methodology (Medcalf *et al.*, 2012). Here the use and value of green infrastructure is mapped according to the principal ecosystem services allowing the identification of multiple ecosystem services benefits as opportunity spaces for choices for regenerating deprived urban areas.

In **Scotland**, the Scottish Land Use Strategy (Scottish Government, 2011) tries to embed the Ecosystem Approach in policy. Under the 'action proposals' there is a commitment to "Demonstrate how the ecosystem approach could be taken into account in relevant decisions made by public bodies to deliver wider benefits, and provide practical guidance" (Scottish Government, 2011, p.17). There is also wider recognition of the value of ecosystem services (estimated at 20 billion pounds annually) in helping to understand the multiple benefits provided by nature. Scottish Natural Heritage is also championing the Ecosystem Approach within their strategy and delivery programmes.

In summary, our brief review of mainstreaming efforts of ecosystem science reveals a clear bias in the use of ecosystem services explicitly at the expense of other principles of the Ecosystem Approach. The tangible nature of ecosystem services does lead naturally to some components of the Ecosystem Approach being downplayed; in particular the equity, limits and long-termism components which do not lend themselves readily to economic valuation techniques. Thus, there is a need for more active and explicit use of the 12 principles of the Ecosystem Approach championing inclusivity, spatial planning, joined-up governance arrangements and upfront investment in stakeholder participation and involvement. However, this presents significant challenges in translation to policy and decision-makers on the ground.

10.4 Models of Policy- and Decision-making

Securing a better understanding of how the Ecosystem Approach can be effectively incorporated into PPPPs and decision-making processes requires an appreciation of how policy is made and what actually constitutes good practice in policy-making. The Cabinet Office defines policy making as a “*process by which a decision-maker translates their political vision into programmes and actions to deliver 'outcomes' – desired change in the real world*” (Cabinet Office, 1999: 1).

Policy-making encapsulates a wide range of actions and activities including (Institute for Government, 2011):

- stated goals or strategies;
- specific acts such as decisions, announcement and statutes;
- an overriding course of action (e.g. ‘our policy on the environment’); and
- a code of practice (e.g. ‘the school’s policy on late essays’).

Policy-making models have generally been characterised by a top-down philosophy based on the goals of economic rationality or the pursuit of a common societal good (Wesselink *et al.*, 2013). Contemporary policy science translates this thinking into an evolving policy process or *policy cycle* that involves a sequence of discrete stages from initial problem identification through to problem solution.

According to the Cabinet Office (1999), good policy making demands processes and outcomes that are forward looking, outward looking, innovative, flexible and creative, evidence-based, inclusive, joined up, that learn lessons from experience, are communicated effectively and incorporate on-going evaluation and review (Institute for Government, 2011). However, there remains a significant gap between the theory of policy and decision-making and the messy reality within which it often takes place in practice (Hains and Ormerod, 2013). In this reality, political, practical and socio-cultural influences shape different models which challenge or depart significantly from the models commonly associated with the progression of the orthodox policy cycle (Sutton, 1991). These are now explored in turn.

10.4.1 Models of Policy-Making

Policy-making is necessarily a messy and complex process and thus there is considerable challenge in trying to develop models that adequately capture this. There is a wealth of literature in this area but we were influenced strongly by the writings of Sutton (1991) whose work focuses on the overseas development perspective and also Gaston (2013) who considers policy problems within the perspective of an Ecosystem Services Framework. What follows is a typology of different models to help illuminate and unpack the policy process.

10.4.1.1 Linear

The traditional linear model portrays policy-making as a multi-stepped problem-solving process which is rational, balanced, objective and analytical. In the model, decisions are made in a series of sequential phases, starting with the identification of a problem and finishing with a set of actions to manage it. The essential steps involve

- defining the issue or problem;
- identifying alternative courses of action to deal with the problem;

- assessing the advantages and disadvantages of each of these alternatives;
- choosing the optimal option;
- implementing the policy;
- evaluating the outcome.

When combined with input-output models the linear stages above are transformed into a cyclical model: the so-called policy cycle. The cyclical perspective emphasizes on-going feedback (loop) processes between outputs and inputs of policy-making, leading to a cyclical process. The policy cycle framework allows a systematic representation of these phases within which diverse debates, approaches, and models in the field can be compared. However, there has been criticism of this approach based on both its theoretical construction and empirical validity (Jann and Wegrig, 2007; Sutton, 1991).

Nevertheless, this policy cycle orthodoxy is embedded within the Green Book (HM Treasury, 2011) through the ROAMEF (Rationale, Objectives, Appraisal, Monitoring, Evaluation and Feedback) model (**Figure 10.10**). The policy cycle is now embedded in many government departments including Defra which provides a desired route to policy and decision-making where each stage follows on rationally from the previous one. The cycle presents policy making as a controllable sequence where the policy maker produces a policy that meets a clear goal. The policy represents a set of planned actions that are then implemented, with monitoring to assess the extent to which the goal was fulfilled. The framework is technocratic, with politics, values and events seen as external ‘noise’ that need to be minimised.

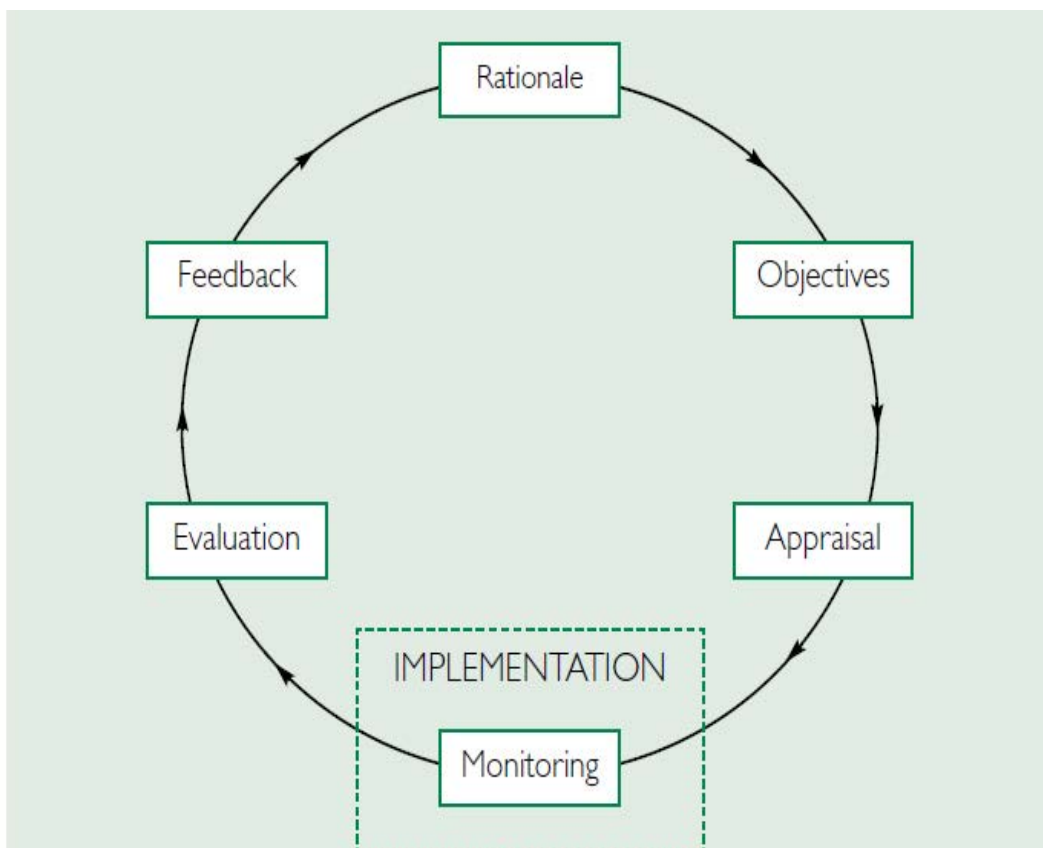


Figure 10.10. The ROAMEF Policy Cycle. (Source: HM Treasury, 2011)

This model has been criticised on several fronts, leading to more complex adaptations. These should not be seen as alternatives, but rather ways of explaining departures from the sequential process as revealed below.

- It assumes that there is one decision-maker, when there are actually many interests and institutions involved and it is through the politics of influence and power that a particular policy response is shaped (Stirling, 2006).
- The focus on positivism and rationality is challenged by those who argue that politics is not an external factor but a valuable and creative process (Stone, 2002; Wesselink *et al.*, 2013), in which policymaking is a contested game of moves and countermoves of policy actors (*ibid.*) leading to the development of interpretative policy analysis.
- Scott *et al.* (2013) argue that far from an exhaustive list of options being identified and assessed in policy, it is often constrained by the lens of the predominant sectoral interest involved which acts as a gatekeeper. This 'filtered' information is then analysed and used to make policy and decisions in isolation leading towards policy-based evidence.
- The delivery phase of the policy cycle requires participation and endorsement of key stakeholders but often this is characterised by conflict resolution, compromise, contingency planning, resource mobilisation and adaptation. New policies often reconfigure roles, structures, and incentives, thus changing the array of costs and benefits to implementers, direct beneficiaries, and other stakeholders.
- Decision-makers need considerable amounts of information in order to make assessments of all the available options and to be able to predict the consequences of decisions made.
- The problems confronting decision-makers often embody conflicting values.

10.4.1.2 Incrementalist

In this adaptation only a small number of alternatives for dealing with a problem are looked at and there is a tendency to only favour options that differ marginally from existing policy (Hogwood and Peters, 1983). For each alternative, only the most important consequences are considered. The selected policy is one that secures the greatest consensus rather than being the optimal solution (Sutton, 1991). Incremental policy-making is essentially remedial; it focuses on small changes to existing policies rather than making fundamental changes. For example, Curry (1993) in criticising agricultural policy suggests that the policy of set aside in the UK has been based on a fallacy of creeping incrementalism with bolt-on changes to the policy rather than more wholesale reform. This model has been described as 'not rocking the boat'.

10.4.1.3 Mixed Scanning

This approach essentially claims the middle ground between the linear and incrementalist models. It involves the policy-maker in taking a broad view across the field of policymaking within which possible options are identified and, from this initial list, more detailed assessments are undertaken into those which are favoured or selected. Often described as the 'third approach', an example of mixed scanning is described by Etzioni (1967), in the context of weather and cloud models.

10.4.1.4 Arguments

In this approach, policy is developed through debate between government and civic society. Participants present claims and justifications which others then review critically. For example, the Conservative party's policy on planning reform was developed in this manner through the Open Source document. It provided a means of communication of ideas, but also serves to reflect certain political stances, moulding social reality according to a preferred outlook and ideology (Open Source, 2009).

10.4.1.5 Social Experiment

This model views social change as a process of trial and error, which involves successive hypotheses being tested against reality in an experimental manner. It is based in the experimental approach of the natural sciences where attempts are made to determine the potential effect of a policy option by trying it out on a group of subjects, some of whom are randomly assigned to a treatment group and are the recipients of the proposed policy, while others are assigned to a control group. The difference in the outcomes for the two groups is the estimated effect of the policy option (Hausman and Wise, 1985). A good example here would be the pilot badger cull undertaken by Defra.

10.4.1.6 Interactive Learning

In this model the policy-making process is more of a partnership between the decision-makers and the individuals, agencies and social groups that have a stake in the policy outcome. The approach promotes an interaction and sharing of ideas between those who make policy and those who are influenced most directly by the outcome. The example of Participatory Rural Appraisal is relevant here; a technique which enables “local people to share, enhance and analyze their knowledge of life and conditions, to plan and to act” (Chambers, 1994, p.1437).

10.4.1.7 Breaking the Overton Window

Of the spectrum of all possible policy options the frame of all reasonable options is called the Overton Window. By ‘reasonable’ it means those considered reasonable in terms of the current political discourse. It is a means of visualizing which ideas define that range of acceptance. Proponents of policies outside the window seek to persuade or educate the public so that the window either moves or expands to encompass them. Lainton (2012) provides a useful example of how the window can be ‘stretched’. A political party proposes education vouchers: this is condemned, but following public arguments a new ‘compromise plan’ is put forward which may then be considered reasonable. Whereas if this watered down plan had been put forward originally it may have at first been considered too extreme.

10.4.2 Policy Cycle and the Influence of Ecosystem Services

The concept of ecosystem services discussed previously has particular implications for the successful and effective operation of the policy cycle. *Gaston et al.* (2013, p.8-9) researching the use and application of ecosystem services in urban green space reinterpret a series of ‘wicked’ policy problems first highlighted by Roberts (2000). Set within the context of our project they pose particular challenges for us when considering the development of a framework for tool use.

- There is no definitive formulation of an ecosystem service management problem, because the processes of describing the problem (such as increasing food production) and describing its management are identical. This can lead to a particular framing of the problem in a way that connects it with the solution preferred by a particular stakeholder.
- Ecosystem management problems have no end point because as there is no absolute formulation of the problem; it is difficult to identify success. As with sustainable development, it is only possible to make and measure progress, rather than coming to a total conclusion.
- Solutions to ecosystem services management problems ultimately depend on who provides and delivers them. Local residents and a local authority are likely to manage a given green space in different ways; the former tending to focus on their own needs, the latter on standardising practices across their portfolio of green spaces.

- There is no immediate test for a solution to an ecosystem services' management problem as a policy option will have many consequences which play out over long periods. This highlights the need for multiple studies and scenarios for the outcomes.
- Every policy response to an ecosystem services' management problem has limited scope for adaptive management and social learning because management actions are rarely entirely reversible.
- Responses to ecosystem management problems are constrained by those who are charged with providing them. This can limit the extent to which conflicting values and ideas are incorporated into the policy mix at the ideas stage.
- Every ecosystem service management problem is unique, set within the cultural and environmental context within which it occurs. This hinders the employment of 'one size fits all' solutions.
- Each ecosystem services management problem can be considered a symptom of the interaction of other ecosystem services problems; for example, poor local climate regulation might follow from a lack of carbon storage and sequestration, as a consequence of poor management of vegetation cover.

In summary, the policy cycle and its attendant variations pose particular challenges for us as we seek to mainstream the Ecosystem Approach explicitly into the policy cycle using key decision support and assessment tools. Thus we have built our methodological response around the context provided within the previous sections. This methodological response is explained and justified in the following section.

10.5 Methodology

10.5.1 Background to our Approach

The mainstreaming of ecosystem science in the messiness and complexity that typify policy and practice, provides a significant methodological challenge. We start by framing our method within a set of initial propositions from which our detailed response then follows.

- The project starts from the premise that current PPPPs and decision-making processes fail to capture the added-value of the environment to society adequately. We posit that to capture that true value, we need to use the lenses of the Ecosystem Approach in general and the Ecosystem Services Framework in particular.
- There is significant merit and additionality for academics, policy and practice communities who are working with frameworks and tools as part of their day-to-day practice to unite as one team (Scott *et al.*, 2013). This shared learning space provides a fertile arena for co-production of knowledge and understanding of how best to mainstream the Ecosystem Approach across a broad range of sectors.
- The range of tools for PPPPs and decision-making is large and complex. Exhaustive coverage of all these different tools is neither feasible nor desirable. Instead, we focus on those key decision-support and assessment tools used and most valued by our research team, case study participants and other informants.
- The project champions the Ecosystem Approach within which an Ecosystem Services Framework is positioned. However, there has been an increasing tendency in both theory and in practical application, to emphasise ecosystem services *per se* and exclude or ignore the broader more holistic principles of the Ecosystem Approach. In its worst manifestation, ecosystem services are cherry-picked with little or no consideration of the wider dimensions of an Ecosystem Services Framework such as governance, equity, legitimacy, norms, stakeholder participation, *etc.* This project unashamedly takes this broader, more inclusive approach to mainstreaming.
- In order to mainstream the Ecosystem Approach beyond the short timescale of this project (2012-2014), we have identified different champions across the built and natural environment to provide a vital legacy component. Through active processes of co-production, their championing of the project's outputs gives our work legitimacy and longevity within particular stakeholder groups.
- In developing and using policy tools it is also important to recognise the different cultural spaces and settings in which they are located, militating against the simple parachuting of tools from elsewhere within one-size-fits-all approaches.
- The Ecosystem Approach is a relative newcomer to policy and practice and there are many agencies outside the natural environment which have no, or very limited, understanding of the Ecosystem Approach and ecosystem services vocabulary. We have therefore made special efforts to connect with professionals in the built environment and business domains in particular. We have identified and explored relevant entry points as 'hooks' to engage them using their lenses and language for PPPPs rather than simply imposing an alien vocabulary upon them.

10.5.2 Building Teams for Co-production

In May 2012, an interdisciplinary research team was established crossing traditional professional, disciplinary, sectoral and scalar boundaries. Academics, policy and practice professionals worked

collaboratively as one team sharing knowledge and experience to co-produce the methodological response and to subsequently develop, test and refine the tool framework (Scott *et al.*, 2013). A core team and an advisory team structure were developed in conjunction with stakeholder and expert panel representatives from the UK NEAFO (**Table 10.4**). The advisory and other team representatives acted as critical friends as the research proceeded (**Table 10.5**).

Table 10.4. The TABLES Core Team and expertise.

| Name | Affiliation and Expertise |
|-------------------------|--|
| Prof Alister Scott (PI) | Birmingham City University (Environment and Spatial Planning) |
| Claudia Carter | Birmingham City University (Environmental Policy and Governance) |
| Jonathan Baker | Collingwood Environmental Planning (Environmental Assessment) |
| Dr Ron Corstanje | Cranfield University (Environmental Science, Policy and Management) |
| Dr Mark Everard | Pundamilia (Environmental Science and Policy) |
| Dr Jayne Glass | University of the Highlands and Islands (Sustainable Development, Participation and Environmental Governance) |
| Mike Grace | Natural England (Sustainable Development and Land Use Policy) |
| Paul Gibbs | David Jarvis Associates (Planning and Landscape Management) |
| Prof Jim Harris | Cranfield University (Environmental Science, Policy and Management) |
| Dr Michael Hardman | University of Salford (Agriculture and Urban Planning) |
| Oliver Hölzinger | Consultant (Ecosystem Valuation and Policy Implementation) |
| Karen Leach | Localise West Midlands (Local and Regional Economic Development) |
| Tim Sunderland | Natural England (Economic Tools and Assessment) |
| Prof Richard Wakeford | Director Rural Strategy (Rural Planning and Policy), Birmingham City University Visiting Professor of Environment, Land Use and Rural Strategy |
| Dr Ruth Waters | Natural England (Ecosystems Assessment) |

Table 10.5. The TABLES Advisory Team.

| Name | Affiliation |
|------------------|--|
| Mark Reed | Birmingham City University (Interdisciplinarity) |
| Nick Grayson | Birmingham City Council (Green Infrastructure) |
| Jonathan Porter | Ecosystems Knowledge Network |
| Eleanor Rowe | Royal Town Planning Institute |
| Charles Cowap | Royal Institution of Chartered Surveyors |
| Mike Kelly | Rural Planning Associates |
| Sarah Buckmaster | Independent Consultant (Communication) |
| Ryan Glass | Big Toe Design (Web Design) |
| Tim Pagella | Wales Environment Centre |
| Dave Raffaelli | University of York (BESS Director) |

10.5.3 Identification of Ecosystem Champions

Using our teams' existing networks we then identified a purposive sample of case studies with individual champions (leaders) who were engaging with the Ecosystem Approach and/or ecosystem services, either explicitly or implicitly¹¹. The case studies were chosen across different cultural spaces and settings so as to represent different scales, sectors and outcomes within and across the built and natural environment. A particular setting could be place-based or plan-based, and could be at different stages in a particular PPP process. Collectively, these case study exemplars provide important intelligence and experience which is embedded into our co-production ethic, ensuring that our method and outcomes are robust and grounded and helping to ground our adapted guidance from the Ecosystem Approach. **Table 10.6** shows the principal case studies that were used and the different questions they were addressing within this project.

Table 10.6. Principal case studies in the TABLES project.

| Case Study | Questions addressed by the Case Study |
|--|---|
| SCOTTISH RURAL DEVELOPMENT PROGRAMME (SRDP) – SEA | How can we structure the SRDP to maximise the environmental benefits? What policies are needed to manage ecosystem services effectively for the long-term? |
| NORTH DEVON/TORRIDGE LOCAL PLAN | How can we recognise the value of ecosystem services in a local plan? How can we adapt local policies and strategies to maintain/improve benefits from nature? |
| GREATER BIRMINGHAM AND SOLIHULL LOCAL ENTERPRISE PARTNERSHIP (GBS LEP) | How can we develop a spatial framework for the LEP that maximises opportunities for economic growth? How can explicit attention to ecosystem services improve development strategies? |
| SOUTH DOWNS NIA | What ecosystem services does this area have and rely on? How can we manage the area better to maximise the benefits of ecosystem services for people (health & wellbeing; economic prosperity)? |
| ISLE OF WIGHT AREA OF OUTSTANDING NATURAL BEAUTY (AONB) | How can we build the Ecosystem Approach into the Isle of Wight AONB management plan? |
| COTSWOLDS AREA OF OUTSTANDING NATURAL BEAUTY | How can we review our AONB management plan mindful of the benefits provided by ecosystem services? |
| BIRMINGHAM CITY COUNCIL | What is the value of green infrastructure to the residents and businesses across the city? How can the Council embed this information to improve its policies, plans and effective investment for different constituencies? |
| STAFFORDSHIRE LOCAL NATURE PARTNERSHIP (LNP) | How can we build the valuation of our environment into the work of the LNP and influence other partners? |
| MUCH WENLOCK NEIGHBOURHOOD PLAN | How can we develop a neighbourhood plan that best captures the views of our town and provides a positive forward planning document to deliver sustainable economic development? |
| EXMOOR South West Water | How can we develop a payment for ecosystem services scheme between South West Water and the landowners in the catchment that maximises environmental benefits and reduces costs? |
| NATURAL RESOURCES WALES | How can we operationalize an Ecosystem Approach in the work of Natural Resources Wales? |

¹¹ In some cases examples were chosen because they provided opportunity spaces to embed the Ecosystem Approach within their policy making processes but they were not conceived within an Ecosystem Approach label. For example, the Greater Birmingham and Solihull Local Enterprise Partnership production of a spatial framework it was important to work within their existing planning lenses.

Crucially, each of the case studies revolved around a key individual who was embedded within our research team; either directly as member of our core/advisory team, or as participants in key events (interviews, workshops and written consultations). Collectively, this group of champions brings leadership, experience, inspiration and encouragement to our mainstreaming efforts.

10.5.4 Scoping Interviews

Following our initial TABLES team meeting in May 2012, individual thought-pieces were produced by team members highlighting problems and opportunities associated with the definition, development, use and evaluation of tools. These were analysed and used to build a framework for the semi-structured interviews for selected case study interviews (**Appendix 1**). Those interviews unpacked individual and agency experiences of tool development and use which, in turn, informed the development of a template for our tool review process (**Box 10.4**). Furthermore, it helped us identify the key stages of a policy cycle that best matched their actual experiences and challenges. These were seen as applicable to any PPPP and covered: IDEAS-SURVEY-ASSESS-PLAN-DELIVER-EVALUATE. These extend the conventional ROAMEF policy cycle used by Defra with the notable additions of IDEAS and DELIVER stages as key factors influencing policy success as perceived by our case study interviewees. The interviews also elicited some insight into how the Ecosystem Approach and ecosystem services had, or might impact upon their own work programmes (see **Appendix 1** for interview summaries).

10.5.5 Ensuring Buy-in: Co-production with Exemplar Case Studies

Mainstreaming the Ecosystem Approach and the Ecosystem Services Framework requires buy-in from stakeholders and practitioners. To achieve this, we adopted a co-production philosophy which captured the knowledge and experience of those individuals in our case studies. The initial phase, as described, involved semi-structured interviews with selected case study individuals¹², which formed the start of an on-going and iterative dialogue over the entire course of the project.

Box 10.4. Generic criteria for a successful tool

A. Language and communication

1. Contribution to aiding the development of shared vocabulary within which principles of EA and ES can be shared with multiple stakeholders across built and/or natural environment
2. Capacity of the tool to develop shared understandings of the many identities and values of places from the perspectives of multiple visitors, residents and businesses
3. Capacity of the tool to improve or enable engagement across different publics so avoiding the usual suspect problem

B. Learning from experience/pedagogy

4. Capacity of the tool to help reveal and value 'hidden' assets that are not recognised by communities or publics that use them
5. Extent to which tool is building on other tools or EA/ES progress
6. Extent to which tool is locally derived or grounded or can be adjusted to closely reflect 'local' context. Is the tool suitable for an open source approach?
7. Extent to which the tool is open to interpretation and application in a variety of forms (that reflect 'cultural' differences)

¹² Our case study examples have been chosen to reflect key agencies and/or individuals who have operated in innovative ways where the principles of the ecosystem approach have been explicitly or implicitly employed. Operating at a range of scales as revealed in **Appendix 1**, they become our critical friends and play a key part in the co-production of the framework and the tool adaptations.

C. Developing and selecting tools

8. Is the tool dependent on a specific funding source? How onerous is the application procedure? What are the chances of success?
9. Does skills development (essential or optional?) and support exist for the tool or is there a body to ensure the optimal and correct use of it?
10. Extent to which current statutory hooks can be exploited by the tool or will benefit the quality or application of the tool (e.g. NNPF's duty to cooperate, SUDS, ecological networks)

D. Informing resultant policies effectively

11. Extent to which the tool informs or improves policies/decisions. What does the tool cover? (full range of positive and negative economic, social and environment impacts / trade-offs?)
12. How does the tool link into the planning system (applications and processes)? At what cost / extra burden?

E. Delivering management objectives

13. Suitability or capacity of the tool to assist with managing visitor needs and pressures within protected areas / the considered area?

F. Local ownership/new governance

14. To what extent can the tool assist in developing statutory plans (local and management plans) and improve ownership and use by publics?
15. To what extent does/could the tool contribute to a new form of community governance in management of the environment?

G. Improved tools: understanding flows, interconnections and spatial issues

16. Capacity to improve spatial understandings of the flows and interactions of various ecosystem services between sectors and at different scales
17. Capacity of the tool to reconcile assessments of options and benefits across different scales (and sectors)
18. Extent to which the tool is capable or can be manipulated to work across sectoral and administrative boundaries
19. Extent to which the tool can handle data shortages and gaps (or is effectiveness considerably compromised?)
20. Extent the tool is able to put landscape/re conservation & designated species/sites on the radar

10.5.6 Unpacking the Types of Tools: Towards a Tool Typology

Given the sheer number and diversity of tools potentially available to policy-makers and practitioners, it was necessary to develop a tool typology that helped people better identify what tools might be best for what purpose. Our initial case study interviews provided important intelligence on which tools were currently most used and valued, and for what main purposes. This helped us develop a tool typology based on these primary functions: Ecosystem Services, Incentives, Regulatory, Valuation, Futures and Public Engagement. These, tools can also be distinguished between being decision-support tools (see Smart *et al.* 2012) or behaviour change tools (e.g. incentive-type tools).

10.5.7 Tool Selection and Reviews

The interviews with case study informants and expertise within the TABLES team allowed the identification of a preliminary sample of tools that were seen to have most impact and value in PPPP processes. These tools were then subjected to an internal tool review process using the components of **Box 10.4**¹³, set within a wider critique of the tool and its potential or actual value in using an Ecosystem Services Framework (**Appendix 2**). This initial tool review process covered 34 specific

¹³ It is important to note that the tool review process was not meant to be comprehensive but was based on the perceptions of respondents as to the most influential and valuable policy tools.

tools allocated across our research and advisory team. These reviews may also be found in our [NEAT tree](#).

10.5.8 Stakeholder Workshops

Two stakeholder workshops (10th October and 17th December 2012) involving our case study participants, core and advisory teams and other invited stakeholders, helped identify assessment criteria for selecting the most useful tools for practical application of the Ecosystem Approach (**Table 10.7**). A follow-on TABLES research team workshop (8th February 2013), then used this intelligence to choose the final suite of tools covering our typology¹⁴ and all stages of the policy cycle (**Table 10.8**).

Table 10.7. TABLES assessment criteria for selecting tools.

| Assessment Criteria |
|---|
| 1. Easy to use and understand without significant resource requirements |
| 2. Currently used and valued |
| 3. Suitability for incorporating an ecosystem services framework |
| 4. High impact in current policy and decision making processes |
| 5. Transparent |
| 6. Robust (able to data gaps and uncertainty) |
| 7. Consistency in use, application and assessment across users |
| 8. Compatible across scales and sectors |
| 9. Deliverable |
| 10. Be based on widely available and accessible data |
| 11. Has mechanisms for engagement and stakeholder participation |

Table 10.8. Final TABLES suite of tools subjected to an Ecosystem Services Framework.

| Tool | Type (classification using our typology) | Decision-Making / Policy Cycle |
|--|--|--------------------------------|
| Strategic Environmental Assessment | Regulatory | ALL stages |
| Environmental Impact Assessment | Regulatory | ALL stages |
| Natural Capital Asset Check | Incentive | Survey |
| Payments for Ecosystem Services | Incentive | Survey – Act |
| Cost-Benefit Analysis | Valuation | Survey – Evaluate |
| Corporate Ecosystem Valuation | Valuation | Survey – Evaluate |
| Ecosystem Assessment | Ecosystem Services | Ideas – Evaluate |
| Ecosystem Mapping | Ecosystem Services | Ideas – Survey |
| SCCAN | Ecosystem Services | Ideas – Survey |
| Futures/Scenarios | Futures | Ideas – Assess |

10.5.9 Mainstreaming through the Lens of the Ecosystem Services Framework

Each tool that comprised the final suite of tools was then allocated to various members of the TABLES team to adapt within procedural and functional guidance, to using an Ecosystem Services

¹⁴ We did not subject public engagement tools to an ecosystem services framework as we made an assumption that all our tools should be using public engagement processes in keeping with Principles 11 and 12 of the Ecosystem Approach.

Framework as developed in the UK NEA (2011a). The approach used was pragmatic. In some cases the tool had already been designed to incorporate an Ecosystem Services Framework; rather than re-invent the wheel, we signposted the existing guidance, but drew attention to any limitations in its current operation that conflicted with the wider principles of the Ecosystem Approach (e.g. payments for ecosystem services and the issue of equity: Defra Guidance 2013; cost-benefit analysis: Treasury Green Book February 2012 and the issue of long termism). In other cases, the tool required us to draw heavily upon the expertise within our particular team (e.g. Strategic Environmental Assessment, Environmental Impact Assessment and Futures tools). Finally, we recruited external experts to help with drafting guidance for some tools, reflecting their pioneering work (Natural Capital Asset Check - UK NEAFO WP1, Ecosystem Mapping and SCANN).

For each tool a guide was produced, involving 2-3 page summaries with a brief description of the approach, the added value that the Ecosystem Approach provided, a case study example and a digest of identified problems or obstacles to overcome. More detailed guidance is produced in the NEAT tree itself.

10.5.10 Guiding the Use and Selection of Tools through the Ecosystem Approach

These tools collectively form the toolkit for application and use in conjunction with overarching advice developed within the different stages in a given PPPP process. In our products and outcomes section we present summary narratives of each of the tools to highlight their potential use, together with selected case study applications. We have also developed bespoke advice for users within an adapted policy cycle format (IDEAS-SURVEY-ASSESS-PLAN-DELIVER-EVALUATE) which signposts, through the identification of key questions in each stage, the most appropriate tool(s) to be used and the key issues to be considered. This advice is based on the translation of the Ecosystem Approach principles into operational procedures, moderated in light of experiences from our case studies and emerging academic thought.

10.5.11 Development of the NEAT tree: A Web-based Portal

In order to promote maximum use and value from this framework we have developed a web-based portal toolkit which allows the user to engage directly with our data and outcomes. Termed the NEAT tree (National Ecosystem Approach Toolkit), this provides free access to all our data and results focussing on our adapted policy cycle (**Figure 10.11**).

National Ecosystem Approach Toolkit



Figure 10.11. The National Ecosystem Approach Toolkit (NEAT Tree). The NEAT Tree illustrates how processes to include the Ecosystem Approach in policy-making can be aided by decision support tools.

10.6 Tools for Mainstreaming an Ecosystem Approach

106.1 Introduction

In this section, we review and justify our tool typology based on the following categories: Public Engagement, Ecosystem Services, Regulatory, Incentives, Futures and Valuation. Each of the tools within the typology can be used, either as an aid to decision-making, or to secure desired behaviours and this initial distinction in function is useful when selecting specific tools; some examples of which are shown in **Table 10.9**. Indeed, many contemporary policy challenges such as climate change, population increase, improving human health and wellbeing and resource depletion can only be addressed if people change their behaviour. Tools which are used to influence peoples' behaviour are rooted largely in behavioural economics and environmental and social psychology (Ashraf *et al.* 2005; Dawney and Shah, 2005). Defra (2011) illuminate these within their 4 E's framework for Sustainable Lifestyles where Enable, Encourage, Engage and Exemplify emerge as key actions for achieving the necessary behaviour change. In pursuit of such goals policy-makers can draw on a range of tools. Regulatory instruments such as legislation, taxes and permits form typical responses. However, incentives can provide a more subtle influence within 'nudge' techniques that incentivise desired behaviour changes. These different types of tools are not mutually exclusive and can actually be most effective when used in combination.

Decision-support tools are designed to tackle the increasing complexity of policy and decision-making processes by enabling an optimal solution or management response to be selected. However, they should not be seen as either decision-making tools or bureaucratic 'evils', as is commonly perceived (Onwubuya *et al.* 2009). They are usually found in two forms; written guidance or software-based guidance systems. Crucially, the resultant policy and decision choices should be reached in a transparent manner, being evidence-based and risk-informed (Pollard *et al.* 2008), and supported by well-designed public engagement processes (Bardos *et al.* 2002).

The list of specific tools provided in **Table 10.9** illuminates the distinction between decision support and behaviour change tools and is not meant to be exhaustive; a fuller list can be found associated with the NEAT tree, designed to help users navigate through a particular PPPP process and select the tool(s) they need. In order to help unpack this typology we provide some background material and justification within summary literature reviews highlighting key issues for mainstreaming ecosystem science.

Table 10.9. Typology of tools distinguishing between decision-support and influencing behaviour tools.

| Major tools category | Tools for decision support | Tools for influencing behaviour |
|----------------------|--------------------------------------|--------------------------------------|
| Ecosystem Services | INVEST | Payment for Ecosystem Services |
| Regulation | Strategic Environment Assessment | Green Taxes |
| Incentives | | Agri-environment schemes |
| Valuation | Cost Benefit Analysis | |
| Public Engagement | All tools should engage with publics | All tools should engage with publics |
| Futures | Scenarios | Scenarios |

10.6.2 Public Engagement Tools

Traditionally, PPPs have relied on top-down or technocratic approaches in their formation, based on expert knowledge at the expense of other local knowledge(s) (Scott 2006). In practice, however, scientific generalisations must be framed within the local context to ensure that they integrate context-specific considerations and engage the support of key local stakeholders (Reed *et al.* 2011). Thus the challenge is to develop tools that allow joint consideration of local knowledge(s) alongside scientific knowledge(s) (Raymond *et al.* 2010). Involving wider publics and organisations in decision-making processes is an important factor in ensuring that a PPP is successful, building trust, understanding and endorsement amongst the wider community (Fish *et al.* 2011).

However, there are significant challenges associated with integrating different types of knowledge which span numerous scales and contexts (Glass *et al.* 2012). These include: differences in world views of project participants and external experts; differences in institutional power or control over access to, and management of, local resources; and changes in perception about the benefits generated by the work (Raymond *et al.* 2010). The active intervention of government or powerful stakeholders can also lead to the manipulation or bypassing of structured decision-making procedures (Scott *et al.* 2013). Engagement problems can also arise when participants represent different backgrounds or expertise, are not experienced in communication, suffer from consultation fatigue or express doubt about the relevance or credibility of a participatory process (Scott *et al.* 2009).

Opening up decision-making to a broad range of actors can also complicate and delay decision-making, blurring who is accountable for what, both during a decision-making process and with regard to the acceptability of outputs of that process (Scott, 2011). Indeed, there is a common misconception that engagement is inherently good and desirable, but many participatory processes fail to define their goals explicitly and, in some cases, can exacerbate the very problems they set out to resolve (Beierle and Koninsky, 2001; Phelps and Tewdwr-Jones, 2001). This is particularly so when the exercise is done as part of a statutory requirement, becoming little more than a tick box exercise. Indeed, Reed (2008) and Scott (2011) extracted a number of best practice principles from published literature, emphasising that public engagement tools only work effectively when they are part of a carefully designed process with strong leadership present. The rest of this section considers how engagement tools might be used as part of a sequential process that is designed to:

- identify tools for early (and continued) engagement that can help open up dialogue and gather information with stakeholders;
- explore and analyse issues in greater depth with stakeholders;
- close down options and decide on actions.

10.6.2.1 Identifying Stakeholders

Effective engagement starts by identifying and involving stakeholders as early as possible in any process and there is a range of methods to identify, differentiate, categorise and analyse stakeholders and their relationships (Reed *et al.* 2009). Stakeholder mapping is a generic first stage tool. Gilmour *et al.* (2011) suggest stakeholders can be identified by considering the following:

- Who will be affected?
- Will the impacts be local, national or international?
- Who has the power to influence the outcome?
- Who are the potential allies and opponents?
- What coalitions might build around this issue?
- Are there people whose voices or interests in the issue may not be heard?

- Who can contribute financial or technical resources?

Including relevant stakeholders also requires tackling or accounting for power and representation issues at the earliest stages. In addition, stakeholder mapping may serve instrumental ends “if it leads to the transformation of relationships and the development of trust and understanding between participants” (Reed *et al.* 2009, p.1936).

A range of survey-based techniques can be used to gain insight into people’s attitudes, values and behaviour regarding a particular issue and explore underpinning reasons for why people think about an issue in a particular way (Fish *et al.* 2011). Structured questionnaires or surveys can be used to collect quantifiable information about views allowing statistical insights. Semi-structured questionnaires or interviews offer a more open-ended approach to eliciting qualitative information allowing contents and discourse analysis, whilst focus groups enable more structured conversations and interactions (Scott, 2011).

A range of bespoke tools can also be used to engage people in decision-making early on. Games are increasingly seen as valuable outputs in a range of European Commission research projects for enhancing public engagement strategies; particularly for hard-to-reach groups (e.g. Devisch, 2008). Games can provide an enjoyable and engaging format which allows consideration of complex issues outside their usual emotive real world context (e.g. Rufopoly as discussed in Scott *et al.* 2013). Performance or arts-based tools can also be used to gather knowledge and insights, empowering stakeholders to get involved in the research process, potentially leading to transformative outcomes for participants (e.g. Rydzik *et al.* 2013). By bringing creative practitioners into interdisciplinary teams, it is possible to develop new ways to enable stakeholders and project participants to understand each other’s conceptions and constructions of a problem or challenge and generate new knowledge and insights that would not be possible using conventional research methods (e.g. Roberts, 2009; Scott *et al.* 2013; Ware, 2011).

10.6.2.2 Analysis and Assessment Tools

Deliberative and iterative engagement tools are increasingly preferred to capture stakeholder views and to elicit a meaningful dialogue over time. Deliberation is important for social change because the process challenges those involved to consider new insights and knowledge, rethink their initial assumptions, and solve problems in a communicative and collaborative manner (Asthleithner and Hamedinger, 2003; Blackstock and Richards, 2007). Using deliberative techniques successfully requires a managed and safe learning environment within which new partnerships can form to work together building trust and capacity through joint problem-solving issues (Scott *et al.* 2011).

Here, participatory mapping can be a helpful tool for teasing out relationships across landscapes and between stakeholder groups and to promote common understanding of different perspectives for more mutually-beneficial management. This focus on enabling stakeholders to assess an issue is a characteristic of Participatory (rapid) Appraisal, a tool that uses a range of community engagement techniques to assess community views on a particular issue (Cornwall and Pratt, 2011). Initially designed as a process that is created and led by the community rather than an outside organisation (Pretty, 1994), nearly all rapid appraisal activities are now facilitated by skilled practitioners (Brown, 2006). Futures and scenario tools are also relevant here, visioning desirable futures and sketching potential pathways (Peterson *et al.* 2003).

106.2.3 ‘Closing-down’ Tools

Common examples of closing-down tools are voting, ranking and prioritisation techniques (Reed, 2008). For highly complex or group decision-making processes, techniques such as participatory modelling (Sandker *et al.* 2010), deliberative multi-criteria analysis (Stirling, 2006) and deliberative monetary valuation (Niemeyer and Spash, 2001) may be more appropriate. Participatory budgeting is a tool that allows participants to decide on the allocation of available public resources, an approach in vogue as part of the localism agenda by the UK Government (Cohen, 2012).

10.6.2.4 Summary

There are many tools available for public engagement but they are often applied superficially as bolt-ons rather than embedded in policy and decision-making processes. Set within an understanding of a particular PPPP, it is crucial that relevant and affected publics are able to shape meaningfully both the process and resulting outcomes through effective engagement opportunities. Building and enhancing partnerships based on trust and mutual respect becomes a crucial part of a programme's and agency's legitimacy and long-term legacy.

10.6.3 Ecosystem Services and Ecosystem Services' Tools

The Ecosystem Services' tools label is used here to identify tools that have been purposefully designed to incorporate ecosystem services. The use of 'ecosystem services' has dominated the development of ecosystem tools in science, policy and environmental activism. However, as already indicated, it is prone to different understandings and applications (Dempsey and Robertson, 2012). Indeed, the focus on ecosystem services is a simplification from its more complex, original conceptualisation that included ecosystem goods and functions (e.g. de Groot *et al.* 2002). The MA (2005) defines ecosystem services as encompassing the multiple values that ecosystems provide to all sectors of society and, by implication, their equally diverse value systems. Thus, systemic analysis of policy or decision-making processes using the framework of ecosystem services can reveal the range of consequent benefits and dis-benefits, as well as the distribution of the benefits and costs across societal sectors. Consequently, ecosystem services are being increasingly used proactively to appraise options or devise new policy interventions that optimise the cumulative benefit to society, set within longer-term effects and intergenerational equity. However, the inherent complexity of ecosystem services and their interdependencies, with abiotic and biotic factors, means that often highly simplified approaches to ecosystem services assessments are employed. The requirement for more complex systems-based and interdisciplinary understandings and applications of ecosystem services, ecosystem benefits and natural capital, is often overlooked for reasons such as:

- only specific services are considered in isolation from the wider context and potentially complex interactions between different services and between services and their context (Bennett *et al.* 2009);
- ecosystem services are considered as linear functions, ignoring thresholds and complex non-linear realities where a relatively small additional change may signify dramatic change of a system (Haines-Young and Potschin, 2010);
- data used are often averages (sometimes not even derived from the area but 'transferred' from elsewhere) rather than showing the range of actual data and considering associated implications (MA, 2003);
- nature is commodified where its elements are subjected to a simple exchange value (O'Neill, 2011).

Depending on the disciplinary or policy lens being used, definitions of ecosystem services vary considerably. For example, Boyd and Banzhaf (2006, p.8) use a narrow definition of ecosystem services as "components of nature, directly enjoyed, consumed, or used to yield human well-being", which accords with neoclassical economic approaches, including cost-benefit analysis (CBA). The

Economics of Ecosystems and Biodiversity (TEEB) (2010) presents a wider interpretation, recognising and accounting for externalities, value plurality and governance considerations, showing how economic concepts and tools can help embed the values of nature into decision making at all levels through:

- exploring the relationship between biodiversity and ecosystem services;
- testing applications across important environmental, social and economic domains;
- highlighting the significance of indirect use values of ecosystems that are largely invisible in assessment and accounting endeavours;
- advocating the embedding of value diversity and consideration of trade-offs in policy and decision-making; and
- explicitly acknowledging uncertainty and tipping points/thresholds through advocating precautionary approaches or safe minimum standards.

10.6.3.1 Ecosystem Services Tools

The Millennium Ecosystem Assessment's (2005) conceptual framework distinguished between four categories of services – provisioning, regulating, cultural and supporting and still remains the most widely recognised and applied framework globally (e.g. Defra, 2007a; Haines-Young and Potschin, 2009; Welsh Assembly Government, 2012). Using the same framework enables cross-comparison between different assessments and areas. In practice, however, the actual definition and measurement of specific services have tended to differ substantially between applications (Haines-Young and Potschin 2011). Inconsistencies can also arise from difficulties in distinguishing between different categories of services and delineating between specific 'functions' and 'services' because of the manifold interrelations and interdependencies, in addition to variations in context, including geographical and temporal scales (MA, 2003; Haines-Young and Potschin, 2011).

Three complementary, yet distinctive, perspectives have been identified for assessing ecosystem services:

- the habitats perspective (identifies the distinct role of habitats to ecosystem services provision and their multifunctional characteristics);
- the services perspective (linking ecosystem services directly to societal benefits/opportunities and problems); and
- place-based perspective (considering the health and future development of specific geographical areas and how this affects human wellbeing and place-making) (*cf.* Haines-Young and Potschin, 2008).

These perspectives are directly relevant to emerging policy instruments associated with the National Policy Planning Framework (e.g. Neighbourhood Plans and Local Enterprise Partnerships) and the Natural Environment White Paper (which created Nature Improvement Areas and Local Nature Partnerships in England). Smart *et al.* (2012, p.4) highlight the potential user needs associated with these new policy instruments, as well as more generally, as providing:

- data about conservation designation, species and habitats at a range of spatial scales;
- information about different drivers of change and their possible future impacts; and
- land-use planning decision-support tools to assist in identifying and balancing competing demands.

The UK NEA (2011a, b) assessed the status and trends of the UK's ecosystems and the services provided at multiple spatial scales, identifying key drivers of change and testing their impacts using plausible future scenarios, enabling the consideration of policy and/or societal response options to secure (maintain or improve) the delivery of ecosystem services into the future. A large part of the assessment focused on identifying and quantifying the value of ecosystem services' contribution to

human well-being through both economic and non-economic analyses. The economic analyses for ecosystem services assessment involved two types: (i) sustainability analyses; assessing stocks of natural assets; and (ii) programme evaluation analyses, seeking to determine the value of the flow of services provided by these natural assets. Both types of analyses were found useful, the former to inform macro-level policy, and the latter to support economic calculations for payment for ecosystem services (UK NEA 2011b, p.1071).

10.6.3.2 Ecosystem Services Tools that influence People's Behaviour

Payments for Ecosystem Services (PES) comprise a suite of market-based tools that together can be used to influence and incentivise behaviours. They link the 'suppliers' of ecosystem services with their 'users' and beneficiaries. Some services (mainly provisioning services) are already traded, however, most are external to today's market, yet are crucial to society (e.g. pollination and nutrient cycling). Therefore, considerable potential exists for the creation of markets for more effective incorporation into decision-making processes and protection. For example, the Organisation for Economic Co-operation and Development estimated the existence of over 300 PES initiatives worldwide in 2010 (Defra, 2010c). A PES scheme is, however, a *voluntary* contract with payments *conditional* on achieving service enhancement or protection (i.e. agreed action/outcome); be *additional* to basic regulatory requirements and not displace detrimental activities elsewhere. The tool has also attracted significant criticism: its focus on a single ecosystem service; the loss of consideration of multiple values by adopting a single exchange value; and creation of power imbalances that may prolong inequalities (Spash, 2008; Kosoy and Corbera, 2010).

10.6.3.3 Ecosystem Services Tools for Decision-Support

Ecosystem service mapping forms a core focus of many current attempts to identify particular ecosystem services within an area (Lovell, 2010; Medcalf *et al.* 2012). Such visual support tools, through GIS applications, have proved relatively successful in breaking down barriers between experts and the public, creating relatively easy to use and understood interfaces for assessing and valuing ecosystem services and benefits. For instance, Maes *et al.* (2011a, p.11) promote the mapping of the services and consequent quantification and valuation, with the aim to forming "an economic argument to protect biodiversity". This approach has been implemented by a variety of organisations and authorities throughout the UK (e.g. Countryside Council for Wales (Bridgend County Council¹⁵); Hölzinger, 2011; Pape and Johnston, 2011).

Ecosystem services assessments at the local or landscape scales are being increasingly adopted by local councils in relation to green infrastructure planning, either in totality or as part of geographical units such as a valley or an Area of Outstanding Natural Beauty or a National Park. The Gaywood Valley project, as part of an EU INTERREG Project, used an ecosystems services assessment to inform their vision for a multiple use green space management plan on King's Lynn urban fringe to create environmental, social and economic benefits (Carroll, 2012). Similarly, Birmingham City Council undertook an ecosystem services assessment of its Green Infrastructure to inform its future development planning strategy (Hölzinger, 2011).

Modelling tools for decision-support can be split into two broad types: **semi-empirical approaches** which aim to represent the underlying processes to some degree and **expert knowledge-based approaches**. Modelling individual ecosystem functions is not novel and there are countless models of functions in the scientific literature. For example, water regulation and water movement can be described by a myriad of hydrological models such as SWAT, INCA, TOPmodel, SHE (Vigerstol and

¹⁵ See e.g. <http://www.youtube.com/watch?v=YpMuLTuo2kg>

Aukema, 2011; Corstanje, 2012). There are also a significant number of soil process models that describe nutrients, soil formation and indirectly climate regulation through carbon sequestration, such as CENTURY and RothC (Corstanje, 2012). These models can be captured in a Geographic Information System (GIS) environment and their outputs aggregated (i.e. some weighted averaging or addition of the different services for a given area; e.g. carbon sequestration + water storage + biodiversity) to generate an assessment of the current state of ecosystem services delivery. In this same environment, different scenarios can then be introduced to assess the impact of decision-making or climate change. For example InVEST is a GIS-based project that uses land use/cover patterns to estimate levels and economic values of multiple ecosystem services, biodiversity conservation, and the market value of the commodities provided by the landscape (Nelson *et al.* 2009).

In many cases, collecting, collating and combining data and processes over diverse ecosystems is not cost-effective or practical. The alternative is to survey experts across particular ecosystems and collate their knowledge which can then be represented within a GIS cause-effect modelling framework. A statistical modelling environment is arguably the most effective way to represent 'expert opinion' regarding the controls which determine the supply of ecosystem goods and services (Corstanje, 2012). Such expert knowledge-based modelling approaches include ARIES and MIMES. The advantage of such an approach is that it can be based on sparse data and relatively simple models, and therefore can readily give estimates of ecosystem goods and services delivery in most situations. The disadvantage is that it is ultimately based on opinion, and is therefore less scientifically robust. A second limitation to this method is that every time a new factor needs to be considered, which was not considered in the original expert knowledge elucidation, a follow-up has to be executed. Current, state-of-the-art approaches aim to capture the expert opinion in a 'belief network', which graphically represents the relationships between the drivers and supply of ecosystem goods and services and underlying this is a probabilistic environment which can supply some of the computational and numerical rigor which is usually associated with empirical models.

Expert-based mapping and modelling approaches (such as ARIES and MIMES) have been criticised for restricting accessibility and use (Vigerstol and Aukema, 2011) because specialised software is required and support information is not readily available (Natural England, 2013). In response, some attempts are underway to represent data so that it is more accessible to the public and those without such software, configuring not only the data, but the interface in which it is created (*cf.* CCW, *circa* 2010; Raudsepp-Hearne *et al.* 2010). Maes *et al.* (2011b) identify a further shortfall, arguing that when mapping is completed and converted into an approachable format, the end result tends to focus on provisioning services and that data on other services, goods or functions (cultural and supporting services) are lacking.

10.6.3.4 Summary

Tools relating to implementing the ecosystem approach in the form of assessing and valuing ecosystems services have been heavily influenced by ecological economics and environmental accounting and resource mapping as well as models of land use change and impacts. There is a danger of oversimplifying and regarding ecosystem services merely as new goods to trade, or as isolated features or commodities to map. Responses are needed within ecosystem services tools that systematically attempt to assess ecosystem functions, benefits and trade-offs across the full spectrum of services rather than doing so on a fragmented service-by-service basis.

10.6.4 Regulatory Tools

Regulatory tools are explicit state interventions in PPP processes in pursuit of specific societal outcomes not achievable through normal market-based or incentive mechanisms (OECD, 2010). The tools and instruments available are diverse; legislation, licenses, circulars, permits, regulations, registrations, administrative guidelines, directives and codes of practice, which collectively shape a complex regulatory architecture for society to understand, use and abide by (Seik, 1996). Black (2008), however, suggests that regulation is far more expansive and encompassing than just laws and rules, forming part of wider governance and institutional processes within which policy and decision-making occurs. Yet the very complexity of globalised society and markets within which regulation now exists, brings with it attendant risks of regulatory systems capture and failure (Freiberg, 2010).

Freiberg (2010, p.24) presents a powerful taxonomy of regulatory tools within which we can start to understand and unpack the complex nature of regulatory environments. It is to this framework that attention now turns and where we complement the arguments with further literature.

10.6.4.1 Economic Regulation

Economic regulation requires market intervention to protect the public interest due to market failure (Stigler, 1971). Here, natural monopolies and external costs (environmental externalities) are the most prominent examples. In the UK context, regulatory agencies are established to address potential abuses; the creation of OFWAT and OFGEM, Environment Agency and Natural England as agencies with taxes, grant payments or tradeable permit schemes as potential response tools. There are, however, inherent risks of regulatory capture where powerful private interests influence these agencies as a way of enhancing profits (Peltzman, 1976).

10.6.4.2 Transactional Regulation

Freiberg (2010: 8) views this as the privatisation and contractualisation in the delivery of public policy. This forms a central plank of contemporary UK government policy enabling local communities to take over local services and assets under the localism banner e.g. Localism Act (2011) and Public Services Act (2012). However, transactional regulation does not require direct legislative authority and rests primarily on the general concepts of contract law. Agri-environment payments, for example, under the Rural Development Regulation, are implemented by the UK government within EU rules.

10.6.4.3 Authorization as Regulation

Authorization protects the public interest by the state authorising particular activities, premises or products through tools associated with licensing, permission, registration, certification, accreditation and litigation. For example, supply chain stewardship schemes certify that products of services meet published sets of standards. The Forest Stewardship Council (FSC) requires certification from sustainable and equitable forestry practices rights through to manufacture of finished forest-derived products; whilst in farming, the Organic Soil Association standard is well-known and independently verified (Everard, 2012).

10.6.4.4 Structural Regulation

Structural regulation involves limiting choice and influencing behaviour so that people act in accordance with the desired regulatory 'zoning' or face sanctions. The design of the built environment, through access routes and public space, directly influences peoples' behaviour; green belt zoning affects land use decisions whilst more subtle influences of urban design and behavioural

responses are evident in Hamilton-Baillie and Jones' (2005) work on crime reduction and anti-social behaviour.

10.6.4.5 Informational Regulation

Information is an indirect regulatory tool enabling people to make improved decisions. For example, disclosure (e.g. fat content in food; surgeons mortality rates; school league tables) provide mechanisms to help people make informed choices. In the context of PPPPs, Impact Assessment (IA), Strategic Environmental Assessment (SEA) and Environmental Impact Assessment (EIA) form part of the policy appraisal family of tools that seek to inform and support the development and implementation phases of legislation and PPPPs (Eftec, 2010). In effect, these tools provide a solid foundation on which to build more robust decisions. Despite these aims, there is significant evidence which suggests that these support tools have had a limited effect (IEMA, 2011); for example, issues of resources and time available with many decisions made outside SEA and IA frameworks (Sheate, 2012). There are also concerns that these tools are seen as hurdles to jump through rather than as useful, supporting processes (Eales and Sheate, 2011).

10.6.4.6 Legal Regulation

Legal regulation involves the use of 'standards' (emission, product controls, process and equipment standards), planning and building controls (building regulations). Standards ensure that minimum requirements are complied with as a means of regulating performance. Whilst this provides 'adequate' solutions, they are essentially limiting 'negative' aspects of an activity rather than promoting good practice. Furthermore, they can also restrict behaviour based on their primary function. For example, building regulations, with their focus on safety, have been criticised for a lack of emphasis on quality. The Passivhaus (2013) standard provides an interesting response to this.

10.6.4.7 Embedding the Ecosystem Approach and Ecosystem Services into Regulation

There is significant interest in embedding the Ecosystem Approach into regulation. For example, the UK's Natural Environment White Paper, EU Biodiversity Strategy, the International Convention on Biological Diversity and the National Planning Policy Framework, collectively represent a vanguard of efforts to increase consideration of these issues within governmental policies (Baker *et al.* 2013). The adoption of ecosystem services focussing on benefits means that the environment can potentially be incorporated positively into decision-making and this taxonomy helps improve the value component which has suffered under market failure conditions in decision-making (Baker *et al.* 2013).

The recent review of the EIA Directive proposes the inclusion of ecosystem services in the topics EIA must consider - though only those derived from biodiversity (Annex IV (4)). This directness is one of the potential strengths of regulatory tools in this area, though as seen in the proposed amendment Directive (COM (2012) 628 final), in the inclusion of 'biodiversity and the ecosystem services it provides a potential concern if the definitions are inadequate or even simply wrong (for example ecosystem services are not only derived from biodiversity).

Baker *et al.* (2013) identify two factors leading to this interest in incorporating ecosystem services into regulatory tools:

- using ecosystem services presents a more complete, holistic and integrated consideration of the socio-ecological system;
- using ecosystem services enables a more positive framing of the environment in terms of communicating the multiple benefits to stakeholders and decision-makers.

Crucially, these two factors address some of the weaknesses in the regulatory arena. In particular, the issues around unintended consequences and cumulative impact. This is not necessarily a simple process as highlighted in Sheate *et al.* (2012) but the integrated and systemic nature of the Ecosystem Approach does allow for the more effective consideration of indirect effects and a broader interpretation of the system under consideration.

10.6.4.8 Summary

Regulatory tools are increasingly used to balance agendas in pursuit of sustainability. This poses a significant challenge in elevating the environmental interest into decision-making processes (Baker *et al.* 2013; Spash, 2008)¹⁶. Here the family of Impact Assessments have formed the principal regulatory response, although their effectiveness has been questioned on their stated environmental efficacy (Söderman and Saarela, 2010 and also in WP9 Report) and by those who claim they are being used primarily to justify a particular policy decision that has already been made rather than as an informational decision support tool (Hertin, 2009).

However, when regulation is well-conceived and integrated within public policy, it provides certainty and clarity, addressing market failure and supporting long-term investment decisions which, in turn, can drive behaviour change where incentives alone are not sufficient (Ballatine and Devonald, 2006). Adams (2004) sees the regulatory tools environment as an attempt by the state to enhance the efficiency, equity and sustainability of market products and, in so doing, accords well with the core principles of the Ecosystem Approach.

There is, however, potential conflict between one set of regulatory tools trying to do one thing when another set of regulatory or incentive tools do another. For example, Adams *et al.* (in press) highlight significant regulatory scalar disconnects where policy at the local authority scale (enforcement action for demolition) contradicts with national government policy (exemplar for low impact development) in the case of a permaculture dwelling in open countryside at Brithdir Mawr Wales. Furthermore, Wakeford (2012) notes the many different, potentially conflicting and duplicating regulatory and fiscal incentives available to a tenant/landowner on various land use options.

In moving from these problems of regulation towards more positive actions OECD (2010) have identified key drivers for more effective regulatory governance. These include:

- a solid research and evidence base;
- strong institutional leadership and oversight;
- clear accountability and transparency between private and public responsibilities for regulation;
- effective consultation, communication, co-operation and co-ordination across all levels of government and beyond, including international and neighbourhood arenas.

These drivers are not assured within a regulatory environment. Regulation needs careful control and management, given the attendant risks of moving costs between scales of operation, sectors and groups and regulatory capture. The over-hasty adoption of inappropriate regulation could add unnecessary burdens, inhibit innovation and harm competitiveness. As Gibbons and Parker (2012) recognise, one must:

- not presume that regulation is the only answer to a problem;
- take time and effort to consider and provide robust analysis of all of the policy options, including 'do nothing';
- make sure there is substantive evidence to support the preferred policy option and ensure that it is properly referenced and sourced;

¹⁶ See also the valuation tools literature review

- produce reliable estimates of the costs and benefits and assess the risks, costs and benefits appropriately;
- assess non-monetary impacts thoroughly;
- explain and communicate results clearly.

10.6.5 Incentives

An incentive is the offer of a reward or inducement which is designed to induce a desired behaviour (Cooke *et al.* 2011). Incentives consist of various non-fiscal and non-regulatory tools (Barnes *et al.* in press) ranging from the financial to the reputational and may incorporate ‘nudges’ (Thaler and Sunstein, 2008). Similarly, disincentives threaten some form of punishment if an inappropriate behaviour is performed. Incentives include taxes, agri-environment schemes and private payment for ecosystem service schemes and offer an important means for securing land management goals which may protect or enhance the provision of ecosystem services.

10.6.5.1 Limitations of monetary Incentives

Although environmental valuation approaches to incentives are widely used in both academic and policy-making communities (HM Treasury, 2003), there is considerable debate about the validity of these methods. Concerns include: when people have multiple and complex preferences (Spash and Hanley, 1995); where there are intergenerational rights (Hubacek and Mauerhofer, 2008); when people have limited capacities to understand complex goods (Christie *et al.* 2006); and whether preferences are expressed by individuals, by individuals in a group setting or as a group (Clark *et al.* 2000; WP6 Report).

There is now widespread acceptance that decisions are not made solely on the basis of profit maximisation; decisions incorporate a range of other factors, including rules-of-thumb and replicating the behaviour of peers or others from a social network (Avineri, 2012). Behavioural economics question the rationality of decision-making processes, instead emphasising the role of emotion, habits, customs and concerns about issues such as social and environmental justice (Ashraf *et al.* 2005). Consequently, there is debate about the economic basis for incentives designed to support the provision of ecosystem services, and a growing recognition that monetary incentives can only influence behaviour to a certain extent. To be successful, monetary incentives must be integrated with other types of incentive and designed with an appreciation of principles from social psychology; e.g. Fiske *et al.*'s (2004) “core motives” approach. For example, PES schemes have been questioned on their ability to incentivise changes in the management of large upland estates, given that not all such estates are profit maximising concerns (Glass *et al.* 2013b). There is also evidence that interventions that fulfill various motives simultaneously are likely to be most successful; e.g. financial incentives coupled with improved understanding (van Vugt and Samuelson, 1999). Indeed, incentive schemes might be counter-productive if they undermine other core needs; e.g. fines or payments turning a behaviour from an ethical issue to an economic issue (van Vugt, 2009).

10.6.5.2 Paying for Ecosystem Services (PES)

A good example of this linkage is within agri-environmental schemes, which are effectively publically funded PES schemes. Various studies have examined factors that influence the uptake of these schemes (Defrancesco *et al.*, 2008; Dobbs and Pretty, 2008) and it is apparent that the level of financial incentive offered still remains the principal determinant. Consequently, incentive schemes must be set at a level that can compete with payments available to land managers from other sources, including the market price, if they are to be successful and actually change behaviour.

However, as Mather *et al.* (2006) recognize if these changes are only secured through financial inducements alone they remain highly vulnerable as economic circumstances change.

Other factors that influence the uptake of incentive schemes include transaction costs (e.g. learning about new practices, reporting requirements) and the flexibility of management options (Falconer, 2000; Vanslebrouck *et al.* 2002). Because agri-environment schemes in the EU (and often elsewhere) are based on the principle of paying land managers for income foregone to undertake management for ecosystem services (in order to be compliant with World Trade Organisation regulations), the level of payment available has not always been sufficient to attract large numbers of entrants to 'higher level' schemes that are most closely linked to the provision of ecosystem services.

However, private PES schemes are not restricted in the same way as agri-environment schemes and thus can set payment levels accordingly. The number of private PES schemes has proliferated in recent years, with schemes based on the provision of water services (primarily water quality and flood risk attenuation) being particularly popular. For example, in the UK a number of water companies have introduced private PES schemes in an attempt to alter land management practices on water catchments feeding their reservoirs. In many cases, it is cheaper to pay for changes in land management that can improve water quality at source than it is to pay for the provision of new water treatment works. Similarly, carbon offsetting is a source of finance for woodland creation under the UK Woodland Carbon Code that can be used as part of corporate carbon accounting under CC's Greenhouse Gas Accounting Guidelines.

Defra's PES Best Practice Guide (Smith *et al.* 2013) provides examples of a range of private PES schemes. This guide emphasizes the need for PES schemes to couple monetary incentives with an understanding of the wider needs and preferences of potential buyers and sellers, and an understanding of organizational, legal and technical issues. Monetary incentives alone are unlikely to facilitate major shifts in the management and provision of ecosystem services; therefore careful consideration must be given to the design of such incentives.

10.6.5.3 Summary

Incentives take many forms but may vary in their importance to different cultures and stakeholder groups. However, evidence suggests that monetary incentives are particularly important where the market economy dominates, disproportionately influencing resource management decisions. Consequently, most incentive tools applied to the management of ecosystem services in a UK context are monetary-based. However, there is increasing evidence that monetary incentives alone cannot incentivise all forms of management behavior that may be desired with land management decisions drawing on a range of internal (psychological) and external (monetary and social) incentives.

10.6.6 Futures Tools

The UK Government defines futures research as: *"The systematic examination of potential threats, opportunities and likely future developments which are at the margins of current thinking and planning. Futures research may explore novel and unexpected issues, as well as persistent problems or trends"* (Defra, 2002).

Futures research can inform policy development and it is used widely in the private and third sectors to anticipate and prepare for future shocks and facilitate long-term planning (Roney, 2010). For example the governments Foresight Programme has helped the UK Government to think

systematically about future options through a testing of today's decisions to future uncertainties (Foresight, 2013).

There are a number of tools that can be used to identify, analyse and communicate insights about the future (Lowe and Ward, 2009; Sardar, 2010), ranging from highly quantitative, predictive approaches based on scientific evidence (e.g. forecasting), to more qualitative approaches based on a combination of local/lay and scientific knowledge (e.g. visioning). Tools available for anticipating and planning for the future vary according to the epistemological¹⁷ assumptions (Aaltonen, 2005). We focus around those generic Futures tools that are most commonly used, with particular relevance to ecosystem services.

10.6.6.1 Quantitative Tools

Forecasting models assess past performance and extrapolates those trends to create future scenarios. Software development has enabled forecasting calculation to become more accurate and precise with highly complex statistical models employed. Yet, despite the accuracy of short-term predictions, longer-term forecasts have higher margins of error (Wright and Rowe, 2011).

In attempts to gain environmental foresight, substantial effort has been devoted to forecasting the future of social-ecological systems; for example in the climate projections of the IPCC (Thrush *et al.* 2009). However, such attempts have a poor track record due to their high uncertainty (Bengston, 2012). Although, potentially helpful in guiding decision-making, the perceived precision of forecasts may provide decision-makers with a false sense of certainty, meaning they prepare for a narrower range of futures, only to discover at a later date that the models were incorrect (Reed *et al.* 2013a).

10.6.6.2 Horizon Scanning

Horizon scanning involves a number of processes for identifying and understanding emerging changes to the external environment of an organization or area of interest. Horizon scanning techniques were developed by the military during WW2 for intelligence on enemies (Bengston, 2012) but now have become standard practice in business, in many government agencies and in a range of other sectors.

The use of horizon scanning in environmental contexts and organizations is relatively limited but the UK foresight programme funded through BIS represents a significant UK government investment. Sutherland and Woodroof (2009) present a taxonomy of scanning methods in different settings, whilst Sutherland *et al.* (2008, 2010) outline scanning exercises for biodiversity and global conservation issues. The National Advisory Council for Environmental Policy and Technology recommended that the U.S. Environmental Protection Agency create an ongoing, institutionalized scanning system (U.S. EPA, 2002). The U.S. Army has an [Environmental Policy Institute](#) that conducts futures scanning on environmental issues and the [iKnow](#) project which considers the Future Ecosystem Services, used horizon scanning as one of its key futures tools.

10.6.6.3 Delphi

The Delphi technique was developed at the RAND Corporation in the 1950s to investigate the potential impact of nuclear war (Linstone and Turoff, 1975) but now has been applied to a wide range of technological, environmental and other policy challenges. Delphi has a number of operational variations but generally involves gathering feedback from a panel of assembled experts

¹⁷ Our understanding of the nature of knowledge

over multiple rounds (Bengston, 2012). In a typical process, panel experts respond to questions without knowledge of the other panelists. Responses are summarized for each expert in a report, with participants given the opportunity to revise their individual responses based on views of other participants. It is usual to have approximately three rounds, after which consensus or contrasting views emerge. The aim is to achieve stability of responses. The technique explores contrasting and minority views and opinions and can help understand uncertainty. The Delphi method has occasionally been applied to natural resource and environmental issues. An early application looked at “future leisure environments” (Moeller, 1975). Other environmental applications of Delphi include GM and Nanotechnology (Renn, 2004) and more recently for assessing sustainability of Highland Estates in Scotland (Glass *et al.* 2013).

10.6.6.4 Scenarios

Scenarios are neither predictions nor projections, but storylines about the future in order to help organisations think about how things might change and what can be done to promote or prevent possible future outcomes (Rural Futures Report, 2005; O’Neill, 2008). Scenarios enable choices to be made when the future is uncertain (Bohensky *et al.* 2006). The UK NEA (2011a) recognises the importance of the multi-purpose nature of scenarios, generating not only plausible futures, but also social learning. The use of scenarios has become more prevalent over time triggered by Shell’s use of the technique to anticipate the 1970s oil shortage, leading to the potential of futures work being recognised and valued by many agencies (Kass *et al.* 2011). They also form a separate Work Package in the UKNEAFO (see WP7 Report).

Within the original UK NEA (2011a), working with scenarios was considered important to visualise the future in an accessible way, allowing decision-makers to appreciate the sensitivity of UK ecosystems to a range of drivers of change and tailor responses accordingly. Scenario tools are widely used for managing future change in the context of the natural environment (Marchais-Roubelat and Roubelat, 2007). The approach has been used in a variety of ecosystem service related areas, from anticipating risks with regards to food security, to planning a climate change agenda.

A growing number of studies incorporate, or are based on, scenario methods. Examples include the Intergovernmental Panel on Climate Change (IPCC) reports (IPCC, 2007), the Millennium Ecosystem Assessment (Carpenter *et al.* 2005) and the World Water Vision Exercise (Cosgrove and Rijsberman, 2000). Most climate change scenario analysis under IPCC used quantitative modelling (e.g. Nakicenovic *et al.* 2000, 2005). However, recent IPCC scenario analyses include quantitative modeling combined with narrative approaches using participation, and more holistic approaches to climate scenario development (Carter *et al.* 2007).

Stakeholder¹⁸ participation¹⁹ in scenario development has become an important consideration in scenario development (Reed *et al.* 2013b). Tress and Tress (2003) found that participatory scenario development involving local residents helped build trust and increased acceptance of planning decisions, whilst enabling planners to produce better plans by integrating the local knowledge elicited. Similarly, Reed *et al.* (2013b) showed how engaging stakeholders in the development of scenarios in UK uplands made scenarios more relevant to stakeholder needs and by integrating local and scientific knowledge(s), increased the diversity, detail and precision of scenarios developed.

10.6.6.5 Backcasting and Wind Tunneling

¹⁸ We define stakeholders as those who are affected by or can affect a decision or action (after Freeman, 1984)

¹⁹ We define participation as a process where individuals, groups and organisations choose to take an active role in making decisions that affect them (Reed, 2008)

Backcasting represents a policy-led adaptations to scenario type work. They begin with the identification of a desired end state and then works backwards to the present in order to determine how that end-state can be best achieved (Dreborf, 1996). There are a number of variants to the backcasting methodology. Robinson *et al.* (2011) view backcasting as explicitly normative and design-oriented with the aim to explore the implications of alternative paths. Future goals and objectives need to be defined, and then used to develop a future scenario. Once the future has been envisioned, the steps to get to this vision are defined, starting at the point nearest to the future and working back to the present time. Backcasting has been used to plan for time periods (up to 10 years) and has been applied to the marketing of innovations (e.g. Boons *et al.* 2012), and as an-add on to scenario planning (Robinson *et al.* 2011). Backcasting has been used in environmental analyses, particularly in Canada (e.g. Gleeson *et al.* 2012). Everard *et al.* (2009) have employed backcasting in relation to ecosystems science in their work on an integrated catchment value systems model. Manning *et al.* (2009) use backcasting to provide a structured framework for achieving large-scale ecosystem restoration, along with milestones and scenario planning.

Wind-tunneling is similar to backcasting in that it involves a similar process of reflective thinking to achieve a desired outcome. The tool differs by involving a form of test as to whether the decision will be particularly effective in the future (see for example Windtunneling, 2011). Although a relatively new concept, van der Steen and van Twist (2012) argue that it is the most relevant for today's policy-makers, which leads to continual scrutiny of decisions.

10.6.6.6 Visioning

Visioning is a flexible process for identifying future aspirations of a group of people (e.g. organisation, firm, community, interest group) involving the prediction and understanding of long term challenges and imminent problems (Steele and Price, 2009). Visioning processes are often linked in with scenario planning as it helps generate and evaluate alternative future patterns. Visions are usually constructed by several actors in a group, with each adding to the idea and working out how to implement the vision in reality (Kallis *et al.* 2007). They can be informally constructed, through conversations, or more formally through workshops (Van Der Helm, 2008). In Scott *et al.* (2013) visioning was used in field situations experientially where participants constructed visions of different rural-urban fringes over the course of three visits using reality prompts from the setting. The vision tool then acts as a compelling statement of a desired future that a group or organization wants to create based on shared deep values and purpose (Bezold, 2009).

Visioning has been utilised in a number of environmental cases, including Defra's Food 2030, which aims to addresses the food concerns (Marsden, 2010), and Wilkinson and Mangalagiu (2011) who explored a vision for climate change impact on organisations. Bookman (2000) describes a comprehensive example of visioning applied to the future of coastal areas in the U.S.

10.6.6.7 Summary

Futures tools have been applied to many subjects and situations in the last 50 years; however, they are still relatively new to environmental issues, with the exception of scenario analysis. The challenges to ecosystems services are characterised by the need for more long-term approaches which are not well suited to our short-term governance systems. However, we face a more risk-laden future, requiring 'anticipatory governance' (Guston 2007), which requires new tools for thinking about, and planning for, the future. Unfortunately, current tools and practices for ecosystem service planning, such as forecasting, have proven to be less effective than hoped, due to the complexity of ecosystems and the short time frames over which reliable predictions can be made. Whilst tools such as scenarios, visioning, foresight and backcasting show considerable

promise, they require greater evaluation as to their effectiveness in policy and decision-making for ecosystem service planning over the long-term.

10.6.7 Valuation Tools

Decisions are generally conceived of as choices and trade-offs between competing alternatives across environmental, social and economic priorities. Such choices often require some form of valuation to reveal the relative weights given to aspects of a decision. One of the main aims of valuing ecosystem services is to make the overlooked and 'hidden' values of nature explicit (Daily *et al.*, 2009). Thus valuing non-market ecosystem services allows better informed and more rational decision-making (Bastian *et al.* 2012). However, decisions are not made by ecological experts; therefore it is important that decision-makers have tools that can be understood, used, applied and communicated within transparent decision-making processes (Fisher *et al.* 2009).

10.6.7.1 Valuing Environmental Goods and Services

The literature on valuing non-market goods and services has grown constantly, fuelled exponentially with the advent of ecosystem services (Atkinson *et al.* 2012). Scientists have developed a set of valuation tools and methods to value non-market ecosystem services in monetary terms (Costanza *et al.* 1997; TEEB, 2010). Whilst earlier attempts to value ecosystem services focused on the 'total value', more recent developments value the marginal changes in the provision of ecosystem services depending on policy options (UK NEA, 2011).

Utilising the total value of ecosystem services promotes the services and benefits ecosystems provide to human wellbeing to a broader audience (Fisher *et al.*, 2009). However, valuing marginal changes, depending on the management of ecosystems, is superior for decision-making. The UK National Ecosystem Assessment (2011a) contends there will be choices between options, with values assessed in the dimensions of relative costs and benefits of marginal changes in the provision of ecosystem services. Methods now exist that can unite natural sciences with economic assessment to estimate the relative value of changes under different scenarios and which thereby inform decision-making.

Another recent development is the shift from methods based on aggregated individual preferences to shared social values and principles of deliberative democracy. This includes value domains like fairness, social equity and sustainability (Hermann, 2011; WP6 Report). Furthermore, valuation focuses more on the valuation of 'final ecosystem services' which can directly be 'consumed' by humans rather than ecological processes benefiting or underpinning other ecosystem services such as regulating services (Atkinson *et al.* 2012). This is important to avoid double-counting when valuing ecosystem services.

10.6.7.2 Dimensions of Valuation Tools and their Application

Monetary valuation tools reveal values given in financial currency; non-monetary valuation tools reveal values qualitatively or as 'weightings'. The main advance of monetary valuation is that outcomes are given in a common metric which allows the user to derive 'net' benefits and costs (Fisher *et al.* 2011). However, monetary valuation is complex and demands robust primary valuation studies that cover ecosystem services relevant to the decision-context. Conducting such studies can be very expensive with significant uncertainty and knowledge gaps; significantly, not all ecosystem services and their attributes can be valued in monetary terms particularly cultural ecosystem services and non-use values (Atkinson *et al.* 2012).

Thus applying monetary valuation methods exclusively exposes an inherent risk that the results hide more than they reveal giving a false sense of certainty. Monetary valuation using contingent valuation is restricted to relatively simple scenarios that are conceptually manageable for participants. This makes it really challenging to incorporate risk, uncertainty and complexity. In addition, it is often unclear exactly how changes in ecosystems lead to changes in final benefits. In the case of cultural services, it is also problematic to conceptualise ‘subtle’ cultural benefits of settings such as sense of place in a way that fits a monetary valuation framework (see WP5 Report). Furthermore, it may not always be appropriate or desirable to place monetary values on ecosystem services; for example in cases where no acceptable substitute exists without causing significant biodiversity loss (Turner *et al.* 2003). Therefore, non-monetary valuation or the combination of monetary and non-monetary valuation tools can be highly beneficial.

One option for non-monetary valuation is to collect relevant information from the literature. However, such information for a specific decision context is not always available. An alternative is to base values on expert judgement. Experts can, for example, ascertain ‘weightings’ to specific ecosystem services based on their knowledge and experience. Alternatively, values can be elicited from focus groups or citizens’ juries. The latter technique is designed to obtain public opinion on different policy options and their impacts on society, usually informed by experts or relevant evidence (Spash, 2007). As a general rule a critical interpretation of findings should be mandatory whenever valuation tools are applied.

10.6.7.3 Monetary Valuation Tools: Primary Valuation Stage

As a general rule, valuation tools essentially only help provide an approximation of the ‘real’ value, though Helm and Hepburn (2012, p.17), for example, argue that “*it is better to be approximately right, than precisely wrong*”. If ecosystem services are traded in markets the value can often be derived from (adjusted) market prices. However, many ecosystem services are not traded in markets as they occur as externalities. A party might for example benefit from water quality improvements upstream without paying for such improvements. In such cases the market price does not reflect the full benefits (costs) of a transaction. Sometimes it is possible to derive such values indirectly from market prices. Applying the revealed preferences method, one derives the ecosystem services value from market goods and services which contain environmental attributes. One example is the hedonic pricing method where differences in property prices dependent on environmental surroundings are used as indicators for the value of such externalities. So, for example, living adjacent to a green space or park leads to higher prices (UK NEA, 2011a). Stated preference techniques, on the other hand, elicit the value of ecosystem services by asking people their willingness-to-pay (WTP) or willingness to accept (WTA), in terms of non-substitutability of certain areas, habitats or provisions, for ecosystem services if there were a market. The latter technique can be applied to a wide range of ecosystem services including cultural and intangible ones. Such techniques have attracted significant criticism, however, leading to over valuation (WP6 Report).

An emerging tool is Deliberative Monetary Valuation (DMV) (Niemeyer and Spash, 2001). This encapsulates a wide range of approaches incorporating participatory, deliberative and/or social-learning processes, to establish a monetary value for the benefits of environmental goods. In DMV, small groups of participants explore the values that should guide their group decisions through a process of reasoned discourse (Howarth and Wilson, 2006). DMV addresses the critique of contingent valuation that they do not assess risk and uncertainty and capture the intricacies of human values and that values cannot be assumed to be pre-formed (Kenter *et al.* 2011).

10.6.7.4 Benefit Transfer

Applying primary valuation tools is usually comparatively cost-intensive which limits their efficient applicability, especially to support 'everyday' decisions. The benefit transfer approach offers an alternative by transferring values from primary valuation studies ('study site') to the relevant decision-making context ('policy site'). The application of the benefit transfer approach can be seen as a practicable and cost-effective way to implement the Ecosystem Services Framework in decision-making, even if the accuracy of the outcomes declines (Hermann, 2011). It is also recommended by Defra (2007) for making more practical use of environmental values in policy-making. However, if not applied appropriately the outcomes can be strongly biased, leading to poor decisions (Spash and Vatn, 2006; Bateman *et al.* 2011).

10.6.7.5 Valuation Tools: Operational Stage

Cost Benefit Analysis is a popular tool involving a systematic process where expected costs and benefits of a project or policy are compared. It can be used to determine if an investment is efficient; or to compare different investments to identify the most efficient application of funds. For the latter case also the related Cost-Effectiveness Analysis (CEA) might be applied. Here the question to solve is how an intended outcome can be achieved for the lowest costs rather than 'policy on or off'. For both tools monetary valuation is necessary which means that some ecosystem services usually remain un- or undervalued. Another unresolved problem revolves around how equity (current and intergenerational) issues can be better integrated (Sáez and Requena, 2007). Therefore, outcomes must be interpreted carefully.

Social Return On Investment (SROI) builds upon the principles of CBA but optimises social and environmental impacts through the involvement of stakeholders who determine which impacts of a decision should be valued and then apportion monetary 'proxy-values' to such impacts.²⁰ SROI may therefore be able to incorporate a broader set of non-market values but the accuracy of such proxy-values is usually less precise.

For more complex problems or if relevant monetary valuation evidence is unavailable, Multi-Criteria Decision Analysis (MCDA) is used. MCDA is a structural approach that explicitly considers, integrates and evaluates multiple and heterogeneous dimensions and criteria. One main advance of this technique is that it prevents the loss of important information throughout the decision-making process (Kiker *et al.*, 2005). MCDA allows, for example, to integrate information from other tools such as CBA (Barfod *et al.* 2011), or valuation evidence can be evaluated directly. It commonly assigns 'scores' or 'weightings' to different attributes and impacts of policy options to make them comparable across diverse indicators, metrics, and stakeholder groups.

Corporate Ecosystem Valuation (CEV) is a new tool devised by the World Business Council for Sustainable Development (WBCSD, 2011). CEV serves corporate decision-making by identifying and valuing ecosystem impacts by businesses; but also risks and opportunities businesses face from changing ecosystem services. It aims to improve corporate performance including social and environmental goals. In general CEV can be applied to a business as a whole, but also products, services, projects, assets, or an incident. CEV is flexible and allows incorporating monetary and non-monetary valuation as well as different tools envisaged above. However, such high flexibility also contains the danger that the tools may be used inappropriately, e.g. for 'green washing'.

10.6.7.6 Discounting

²⁰ SROI does not necessarily require monetary valuation; the application of quantitative 'weightings' or 'scores' might also be appropriate.

Because the costs and benefits of decisions affecting ecologies often occur in the remote future it is common to calculate their 'net present value'. Usually a discount rate is applied to convert future costs and benefits to a present day equivalent to make them comparable. HM Treasury recommends applying a discount rate of 3.5% for periods of up to 30 years. Afterwards the discount rate declines stepwise to 2.5% (HM Treasury, 2003). However, consensus does not exist about the 'right' discount rate to apply and is indeed controversial (see e.g. Bingham *et al.* 1995; Stern, 2006; Sáez and Requena, 2007; German Federal Environment Agency, 2008; Perino *et al.* 2011). In particular, applying the 'pure time preference rate' for decisions with inter-generational effects potentially clashes with intergenerational equity issues.

The outcome of many valuation tools is sensitive to the applied discount rate. Decisions affecting ecosystems often have intergenerational effects and applying a high discount rate gives benefits and costs occurring in the remote future a very low (often negligible) weight (Atkinson and Mourato, 2008). The German Federal Environment Agency (2008) recommends using a discount rate of 1.5% for periods of more than 20 years with a sensitivity of 0% to account for cross-generational considerations. If the discount rate recommended by HM Treasury is applied, £1000 now is taken into account with £197 in 50 years. However, applying a discount rate of 1.5% would result in £475. Consequently, an open discussion and potentially a revision of the discount rates recommended by HM Treasury would seem to be a legitimate subject of debate.

10.6.7.7 Summary

There is no 'one size fits all' valuation tool. The selection of tools to support decision-making is strongly dependent on the policy context and issues like scale, scope, complexity, budget and time restrictions all affect this. In addition the knowledge level and expertise of the valuer and decision-maker have significant effects on the outcome. Many valuation tools are still under development and divergent applications as well as hybrid forms such as 'social multi-criteria evaluation' or 'deliberative mapping' are evolving. This makes the selection of valuation tools both complex and a crucial element of any decision-making process. To ensure that the application of valuation tools provides robust and reliable outcomes it should be mandatory that tools are not just applied by experts, but also well written up and reported, including a critical and transparent interpretation covering limitations and caveats which apply to all valuation tools. Here the definition of minimum quality standards or a mandatory review process may be beneficial.

If we want to improve decisions by making better use of valuation tools we also have to apply such tools to more relevant decision-making contexts. To date, valuation tools are almost exclusively used to inform (micro-economic) project level decisions. The influence on macro-economic, local economic strategic planning, or spatial planning is extremely limited (see WP2 Report). The same applies for corporate decision-making as a whole. However, to implement such tools within the broad range of (everyday) decisions affecting ecosystem services, it is not just necessary to ensure that the relevant evidence is available and that such tools are applied appropriately; it will also be necessary to change the institutional setup to enhance or make the application of valuation tools compulsory for such decisions.

10.7. Developing the Tool Framework: Mainstreaming the Ecosystem Approach and Case Study Lessons into Practice.

10.7.1 Barriers and Opportunities to Ecosystem Mainstreaming

Our initial discussions with stakeholders and case study participants identified the most commonly encountered barriers and opportunities affecting the mainstreaming of ecosystem science into practice (**Box 10.5**). The identified barriers echo many of the concerns highlighted earlier about the intelligibility and application of ecosystem vocabulary to real-world situations. This reinforces the need for more critical use of terms and definitional clarity, especially for majority audiences who are not familiar with ecosystem concepts and risk being alienated by complex jargon. Furthermore, the impact and added-value of ecosystem science must be communicated more effectively and suited to the specific needs of different audiences who are involved in PPPP processes and outcomes.

Other barriers identified reveal the inherent problems around the valuation of nature that an Ecosystem Services Framework involves. Here the irreplaceability of nature in peatlands and ancient woodlands, for example, together with more intangible intrinsic (existence) value, does not sit comfortably within an Ecosystems Services Framework. It is perhaps here that the dangers of using ecosystem services independently of the Ecosystem Approach principles, poses most danger. There is also value in linking with natural capital and components of spatial planning incorporating environmental and social justice as profitable joint avenues of further investigation (Scott *et al.* 2013).

Box 10.5. Generic barriers to using the Ecosystem Approach in policy and decision-making processes (Source: Case study interviews, summer 2012)

- Lack of knowledge and appreciation of the Ecosystem Approach and/or the Ecosystem Services Framework and terminology amongst the built environment and business professions.
- Highly academic vocabulary and rhetoric that is not easily understood or implemented in practice by people at grass roots level.
- Prevalence of complex ecosystem tools and ecosystem service models which are inaccessible to people on the ground.
- Cherry-picking of selected ecosystem services leads to non-systemic application and also perceived deficits in understanding ecosystem services that are difficult to assess (e.g. cultural services).
- Economic valuation of nature is controversial and fails to capture the intrinsic (non-use) value.
- Ecosystem services are data-heavy and resource-intensive which leads to use of other techniques.
- Institutional inertia is prevalent amongst decision-makers and consultants who are reluctant to adapt working practices to encompass new and time-consuming approaches.
- Resource limitations make new work practices difficult to employ.
- Ecosystem services are seen as the latest bandwagon which may have a limited 'shelf life'.
- No system exists that can be used reliably to test cumulatively and comparatively the different streams and trade-offs within different Ecosystem Services. For example, testing cultural heritage against water quality and the effect of one on the other.

One key problem to overcome is the potential resource costs of new data and modelling requirements from current ecosystem science research. There is a need to ensure that such data are both accessible and assessable to users and decision-makers. The current response suggests that high quality data is rarely available to those working at policy level, except at high cost and agencies are consequently undertaking their own modified 'quick-and-dirty' tool adaptations. Whilst this has great value in terms of grappling with, and learning from, applying ecosystem science in practice, there is an inherent danger of oversimplification with resultant outputs leading to an inflated sense of value by audiences keen for data outputs.

There is also a common misconception that ecosystem services represent a panacea to solve complex resource management problems. This was refuted by our informants with concern that these frameworks do not readily lend themselves to resolving key 'wicked' problems of cumulative impact and trade-offs particularly between different ecosystem services. Some were keen to acknowledge the way the Ecosystem Approach had been relegated due to its more intangible principles.

Box 10.6 identifies the opportunities and benefits realised through mainstreaming ecosystem science. When compared with the arguments from **Box 10.5** it becomes clear that effective communication of ecosystem science becomes key if its potential is to be realised. This further reinforces the need for definitional clarity and the identification of champions for improved communication who have enhanced status and credibility amongst key audiences. The positive reconceptualization of the environment as an opportunity space (as opposed to a constraint) was a strong theme that also emerged. It was recognised that any statutory or government guidance or legislation concerning the application of ecosystem science provided useful hooks for engaging audiences, particularly as resources were limited. Recognising and working with these hooks was important in securing the necessary preliminary traction upon which mainstreaming efforts could then be developed. In the current climate, voluntary actions alone were perceived as less likely to be achieved when faced by competing priorities and reduced budgets. Thus, the Duty to Co-operate through the Localism Act 2011 and the National Planning Policy Framework 2012 both met these criteria; providing powerful entry routes to the majority audiences not familiar with ecosystem vocabulary (i.e. private sector, business and built environment), from where a discussion could be started to support tangible and required outcomes. Here, the role of ecosystem services, as a unifying framework within which participatory decision-making could occur was increasingly recognised.

The valuation aspect of ecosystem services also provided an opportunity to create new environmental markets using market-based instruments to ensure that the value of the environment was embedded more effectively into decisions. The use of valuation techniques in this way shows the value of a systems-based approach in improving cost-effectiveness and contributing more explicitly to the economic growth agenda. The idea of the environment as an asset whilst rejected by some, was seen as a key opportunity space by others.

Box 10.6. Generic opportunities to using the Ecosystem Approach in policy and decision-making processes (Source: Case study interviews, summer 2012)

- Paragraph 109 of The National Planning Policy Framework (2012) legitimatises and requires the use of an ecosystem services framework in decision-making in the built environment.
- The Duty to Cooperate under the Localism Act (2011) provides an important opportunity to use ecosystem services across traditional administrative boundaries in favour of natural boundaries to identify and manage particular resource management problems such as flooding and water quality.
- The use of risks and benefits in ecosystem services lexicon replaces the more adversarial and negative approach in favour of more positive framings for resource management and planning decisions.
- A more holistic understanding of the natural environment will lead to economic development gains as costs due to, for example, flooding and climate change are embedded in decision making.
- Integration of multiple services and associated value systems provides a framework for participatory decision-making.
- Using ecosystem services allows the identification and exploitation of new markets within Payments for Ecosystem Services (PES) schemes.
- The Ecosystem Approach offers a systems perspective to resource management problems enabling improved work practices and efficiencies to occur.

10.7.2 Applying the Ecosystem Approach in Practice

This section addresses the barriers and opportunities identified above by developing bespoke advice to enable people involved with PPPPs, to use the 12 principles from the Ecosystem Approach as they apply to the development and use of tools. **Box 10.7** provides a first step in assessing the implications for tool use from each of the 12 principles. The subsequent advice represents the culmination of our co-production and joint working efforts, drawing from the lessons learnt in the case studies and other stakeholders through interviews, workshops and case study narratives (**Appendix 3**). The translation and adaption of this collective intelligence into usable advice and applying it to the relevant stages of our policy cycle as identified in our conceptual framework, enables us to maximise our impact across the built and natural environment sectors. Crucially, most participants are familiar with the stages of the policy cycle (IDEAS, SURVEY, ASSESS, PLAN DELIVER, and EVALUATE) within the production of any PPPP. Thus the advice is written explicitly to help stakeholders navigate each stage with prompts for actions and key questions within which tools are signposted for possible use.

The advice, however, must be adapted and applied within the institutional context and setting within which the PPPP is located. The vagaries of different governance frameworks cannot be foreseen but must be identified and assessed. Within this understanding a series of key prompts provide staging points in a journey through a PPPP process which then, through the development of tool-specific questions, allows a potential end-user to select and use the most applicable tools within an Ecosystem Services Framework. To help illuminate the advice we also use experiences within a diverse range of relevant case studies as emerging best-practice.

Box 10.7. Ecosystem Approach Principles - adapted for tool use based on Convention of Biological Diversity guidelines (CBD, 2004)

| Principle | Criteria | Implication for development and use of tools |
|------------------|--|---|
| Principle 1 | Promote societal choice using transparent and equitable processes and tools | Importance of using decision support tools that incorporate viewpoints of relevant stakeholders enabling conflicting positions and trade-offs to be recognised and built into processes and decisions in a transparent manner. |
| Principle 2 | Delegate decisions to the most suitable scale | Delegation requires tools to be operable at and across different scales to engage all potential stakeholders. Tools need to be accessible, robust, flexible and intuitive to enable multiple participants to work at different levels. |
| Principle 3 | Assess adjacent effects | This calls for tools that address ecosystems as connected and functioning systems, but which can function with evidence gaps. Mechanisms need to be developed to improve framing and bounding of assessments; where possible natural boundaries should be used at a landscape-scale. |
| Principle 4 | Incorporate economic and social drivers | Tools to support this step need to address relationships between natural systems, people and the economy, for which many links are poorly understood. Recognising and assessing drivers of change are important in tools that consider both knowledge gaps and uncertainty. In particular, we need to recognise that these are complex natural systems, not simply stocks, and so impacts can be difficult to predict. In particular tools that can help realise opportunities for new markets (PES) and deal with spatial impacts and equity implications of interventions are needed. |
| Principle 5 | Encourage ecosystem resilience | The ecosystem services framework provides a rigorous and peer reviewed approach that has scientific credibility. The benefits people obtain from ecosystem services require explicit identification and valuation to signpost maintenance, enhancement and, where appropriate, restoration of particular ecological structures, functions and services. The evidence base becomes a critical consideration. Thus tools have to be effective at incorporating ecosystem services into contemporary valuation and decision-making. |
| Principle 6 | Respond to uncertainty in environmental limits | Our current understanding is insufficient to allow environmental limits to be precisely defined in all cases, and therefore tools supporting adaptive management, coupled with the precautionary approach, are necessary. They need therefore to embed social learning within them to improve future responses and understanding. However realising that many decisions are made in quasi-judicial environments with rights of appeal. |
| Principle 7 | Operate at and across multiple spatial and temporal scales | The drivers as well as responses of ecosystems vary spatially and through time, necessitating management interventions and tools that can operate at more than one spatial and temporal scale to meet management objectives. |
| Principle 8 | Champion a long-term approach | Ecosystem processes are characterized by varying temporal scales and lag-effects. This inherently conflicts with the short-term focus of economic and political systems. We need tools to factor in such long-term horizons to enhance the sustainable flow of ecosystem services, the resilience of productive ecosystems, and finally the satisfaction of human needs in the long term. |
| Principle 9 | Manage change to best advantage | Change is inevitable, so tools are required to help understand and manage it to achieve good/optimal outcomes. Futures tools have a key role here. Adaptive management is also key to anticipating, allowing for and reflecting upon change and to feed lessons learned into continuous policy and management improvement. Caution is required in making decisions which lack flexibility. Feedback of social learning is a fundamental element of successful adaptive management. |
| Principle 10 | Champion biological diversity | Biological diversity is critical both for its intrinsic value and because of the key role it plays in ecosystem integrity, resilience and functioning to provide the services upon which we all ultimately depend. This non-market value (many of them comprising supporting services) needs to be embedded in decision-making tools and processes. |
| Principle 11 | Optimise evidence from multiple sources | Evidence should be secured from all relevant stakeholders across the different sectors of the built and natural environment (local and expert), recognising the need to process different types of knowledge through a range of tools in order to maximise transparency and robustness in decision processes. Tools also need to be able to reconcile conflicting knowledge(s) and views. |
| Principle 12 | Maximise and maintain stakeholder engagement | Most decisions are complex and contested. Decisions should harness and engage the necessary expertise using expert and local knowledge(s) across scales and sectors, bringing differences into formulation of solutions and decisions rather than 'defending' expert views once determined and announced. Deliberative and iterative engagement tools and targeting of both usual and unusual suspects are increasingly required to capture public views and build a meaningful dialogue. |

10.7.3 Pre-requisites to Using the Ecosystem Approach Effectively

The Ecosystem Approach requires viewing PPPPs within a systems perspective where the process by which they are developed is equally as important as the finished product. Here, the focus switches to identify and examine the system of dependencies and interrelationships (Hodge and Monk, 2005). Users should be amenable to working outside their silos (usual scales and sectors) to maximise impact. The guidance contains key questions and prompts that users should actively consider, but there are inherent dangers of merely trying to bolt these onto existing work practices without considering the wider picture and context within which the PPPP is located. **Box 10.7**, our interpretation of the Ecosystem Approach for tool use, together with the guidance, provides only part of that answer. There is also a significant culture change required in the traditional approach to PPPP design and implementation requiring people to move out of their particular sectoral silos and embrace interdisciplinary working.

Our advice is structured around a general context section highlighting the key issues in practice that may enable positive outcomes. This then informs a series of key prompts followed by specific questions that help signpost possible tools to use within our toolkit either individually or as bundles. This is augmented by highlighting relevant case studies as examples of good practice.

10.7.4 Guidance for Policy- and Decision-Makers for Policy, Plans, Projects or Programmes

10.7.4.1 IDEAS

Context

It is often the time invested in the initial IDEAS phase at the outset of a PPPP that is crucial in producing optimal outcomes, yet ironically this is likely to have the least time allocated in practice. Thus, at the outset, it is important to consider the scope and ideas to their widest potential given resource constraints. This is best secured by identifying relevant stakeholders who are likely to be involved in, or affected by, the resulting PPPP. It is also useful to learn from good practice elsewhere and to use existing networks to help inform initial thinking and scoping, ideally incorporating mixed scanning techniques to ensure maximum opening out of ideas, from which you then bound your PPPP within clearly articulated aims and objectives and other non-negotiables within which you operate. IDEAS that have most appeal (for all those affected, now and into the future), should be taken forward to the subsequent phases (SURVEY, ASSESS, PLAN) so as to assess them in more depth and from these analyses, only then select the optimal route(s) as more intelligence and feedback is received. There are significant dangers in pursuing only one pre-conceived or seemingly favoured idea selected in the IDEAS phase, unless it already builds on adequate information from multiple disciplines and perspectives with the explicit support from stakeholders and those affected. It is also important to identify in the IDEAS phase what success might look like and, to that end, to identify what indicators you might use to measure it. Ideally indicators should be selected that cover explicitly all 12 principles of the Ecosystem Approach adapted to the specific context of the PPPP.

Key prompts

- What are the aims and objectives of the policy, plan, project or programme (PPPP)?
- Is there any previous work to inform your initial discussions?
- What are the spatial, political/regulatory and organisational boundaries of your PPPP?
- What are the ecosystem services affected by the PPPP and where are they located (you can map these in the SURVEY stage)?

- Who benefits and who loses from the current use of ecosystem services?
- How can you engage the public and different stakeholders in this stage, using ecosystem services?
- What are the data requirements for the SURVEY phase – are there any gaps in your data?
- What are the key indicators that you can use to measure the success of your PPPP?
- What are the key lessons emerging from the Ideas phase thus far?

Key questions and tools

- Does the policy, plans, project or programme (PPPP) possibly impact on the environment (or trigger any statutory processes and requirements that you must comply with)?
- If yes, use the [Strategic Environmental Assessment \(SEA\) tool](#) (strategic level) (p.90-93) or the [Environmental Impact Assessment \(EIA\) tool](#) (project/application level) (p.93-96).
- What is the value of ecosystem services in your area?
- Use the [Ecosystem Assessment tool](#) (p.90-93) and [Ecosystem Mapping tool](#) (p.85-87).
- Do you want to consider alternative courses of action for your PPPP (i.e. ask what kind of area/development/future do we want)?
- If yes, use the [Futures Tools toolkit](#) (p.101-103) to consider alternatives
- How can you build in public engagement to your PPPP? (Please note that we recommend that engagement should continue throughout all stages of the policy cycle)
- Use [Engagement tools](#) to help you to plan your engagement strategy.
- What are the key lessons that you have learned during this stage?
- Keep a record of these for the EVALUATE stage

Relevant case study narratives²¹

- Greater Birmingham and Solihull Local Enterprise Partnership - Spatial Framework: Novel range of engagement processes and futures work (p. 107-111).
- Natural Resources Wales - Ecosystem Approach Framework: whole approach with clear tasks for ideas phase (p. 129-131).
- North Devon and Torridge Local Plan: Statutory process but using a range of knowledge(s) to inform initial stage via public consultation (p. 111-114).

10.7.4.2 SURVEY²²

Context

The SURVEY stage builds on the options emerging from the IDEAS phase. Failure to invest in evidence collection can lead to only a partial understanding of impacts with unexpected and/or perverse policy outcomes with increased costs over the long-term. However, the SURVEY stage needs not only to be proportionate to the task and resources available, but also be fit for purpose. This means that the scope and quality requirements of evidence should be agreed by all stakeholders (used in the IDEAS phase) at the outset. Using existing data may be sufficient, but serious data gaps need to be identified with costs of collecting new data highlighted for possible inclusion. It is important that the SURVEY stage considers and secures the data that are required rather than just uses existing data that are easily obtainable or quantifiable. However, resource constraints may limit the feasibility of this, but new data requirements can be identified and costed in order to build improvements to the PPPP over time. In order to mainstream an Ecosystem Services Framework in the PPPP, it is desirable that the SURVEY phase incorporates a baseline assessment of the key ecosystem services, as far as possible.

²¹ <http://www.eatme-tree.org.uk/studies.html>

²² <http://www.eatme-tree.org.uk/survey.html>

Key prompts

- Agree the scope and acceptability of data to inform the SURVEY phase with all of your key stakeholders at the outset.
- Can you undertake a baseline assessment of the ecosystem services using existing data?
- What existing primary and secondary data and datasets are required/desirable from the Ideas phase?
- What data exists already (consult partners and wider stakeholder networks including [Ecosystems Knowledge Network](#) and Universities)?
- Are there any significant data gaps?
- How can you best obtain and use the required (primary and secondary data)?
- Consult stakeholders and relevant public(s) over your initial options or proposals.
- What are the relationships and dependencies affecting the delivery and success of the policy, plan, project or programme (PPPP)?
- What are the key lessons emerging from the IDEAS and SURVEY stages thus far? Use the suite of indicators developed in the IDEAS phase to help.

Key questions and tools

- What is the value of ecosystem services in the area of the policy, plan, project or programme (PPPP)?
- Use the [Ecosystem Assessment tool](#) (p.90-93)
- Which survey techniques should be employed, considering the requirements of the PPPP and available resources?
- Consider using the [Engagement tools](#). Focus on reviewing secondary data sources first from your own organisation and other stakeholders before embarking on costly primary data collection.
- What are the evidence requirements for identifying the location, state, value and resilience of ecosystem services most affected by the PPPP?
- Where necessary, use the [Ecosystem Mapping tool](#) (p.85-87) as a baseline mechanism upon which to base future ecosystem assessments.
- What are the key lessons that you have learned during this stage?
- Keep a record of these for the EVALUATE stage.

Relevant case study narratives²³

- Staffordshire Local Nature Partnership: As part of an ecosystem assessment process the survey used selected green infrastructure on key habitats. This selective approach is pragmatic (p. 122-124).
- Isle of Wight AONB management Plan: Here their approach was to start engaging with ecosystem services pragmatically but to identify data limitations so as to build in improvements over time rather than getting bogged down in survey phase (p. 124-127).
- Much Wenlock Neighbourhood Plan: They used a citizen-led survey phase (p. 109-111).
- Greater Birmingham and Solihull Local Enterprise Partnership Spatial Framework: Extensive use made of existing evidence base across the partnership area. Data gaps identified and filled with contract research (p. 118-119).

²³ <http://www.eatme-tree.org.uk/studies.html>

10.7.4.3 ASSESS²⁴

Context

The assessment of evidence proceeds, ideally, from an analysis of each of the different options identified in the IDEAS stage and collected in the SURVEY phase. This requires transparent analysis and presentation of material with any assumptions and limitations made explicit to the audience. This should collectively reveal an optimal solution/decision for your PPPP. In this context, it is important that all the evidence you have collected is analysed rather than ‘cherry picked’ to support one pre-favoured option/solution. In addition, understanding the limitations of SURVEY data is key to selecting the most appropriate and powerful analytical tools.

Key prompts

- What are the limitations of your survey evidence and what assumptions have you made?
- How are you going to manage any conflicting positions or trade-offs in your evidence so as to maximise environmental benefits in line with statutory policies and stakeholder needs?
- How are you going to decide on the preferred option, if relevant?
- Would it be valuable to involve stakeholders from previous stages as well as wider public(s) in your assessment processes?
- Who are you going to present your assessments to, and in what format?
- What are the key lessons emerging from the IDEAS, SURVEY and ASSESS stages thus far? Use the suite of indicators developed in the IDEAS phase to help.

Key questions and tools

- What is the state and value of the ecosystem services in the PPPP?
- Use the [Ecosystem Mapping tool](#) (p.85-87) as a mechanism for the wider ecosystem assessment. Consider future value using the [Futures Tools toolkit](#) (p.101-103).
- What is the value of ecosystem services in the PPPP?
- Consider using an [Ecosystem Assessment](#) process (p.90-93).
- Where are the principal trade-offs between ecosystem services and other priorities?
- Consider using hotspot maps from [Ecosystem Mapping](#) techniques (p.85-87), followed by [Cost-Benefit Analysis \(CBA\)](#) and/or [Multi-criteria Decision Analysis \(MCDA\)](#) (p.99-101). These can be highly visual ways of showing data to your audiences.
- Where are the key ecosystem service opportunity spaces?
- Consider using composite maps of ecosystem services.
- Consider the potential of [Payments for Ecosystem Services \(PES\)](#) schemes (p.96-98).
- What are the best available and accessible tools and techniques available for assessing your evidence?
- Consider [Cost-Benefit Analysis \(CBA\)](#) and/or [Multi-Criteria Decision Analysis \(MCDA\)](#) (p.99-101).
- Can a sustainability assessment matrix as required during a [Strategic Environmental Assessment \(SEA\)](#) (p.90-93) or [Environmental Impact Assessment \(EIA\)](#) (p.93-96) process provide a useful mechanism to help with identifying an optimal option?
- What are the key lessons that you have learned during this stage?
- Keep a record of these for the EVALUATE stage

²⁴ <http://www.eatme-tree.org.uk/assess.html>

Relevant case study narratives²⁵

- Exmoor National Park South West Water - Proposed Payments for Ecosystem Services: This scheme grew out of an analysis that expensive water costs were more than offset by using a payments scheme for farmers upstream in river catchments (p. 115-118).
- Birmingham City Council Green Infrastructure Assessment: Here an assessment was made of the value of green infrastructure in Birmingham. This assessment then informed top level strategies and plans as part of a wider vision (p. 107-111).

10.7.4.4 PLAN²⁶

Context

A good plan requires a clear set of actions linked back to your overall aims and objectives which is traceable from your IDEAS-SURVEY-ASSESS stages previously undertaken. In particular the preferred PPPP option/decision should be clearly identifiable and justified from the ASSESS stage. Many preferred options fail to make this linkage and adopt a hybrid option which was never tested in previous public engagement processes. This can readily lead to rejection by stakeholders and those charged with delivery in the DELIVER phase. A PLAN requires the identification of key person(s), teams or agencies responsible for key actions, set within realistic timescales and delivery of milestones. In many cases the PPPP process is prescribed within regulatory or institutional processes, but it is important to select and bundle the best mix of tools to maximise impact on the ground. It is unlikely that one tool will address all requirements in isolation. It is important that the plan is worked through and communicated with those on the ground who are going to deliver it as well as those who are going to be affected by it.

Key prompts

- Within the PLAN and from the previous ASSESS stages, identify how and which ecosystem services will be enhanced and/or protected (related to your overall aims and objectives). furthermore identify any ecosystem service losers.
- Identify the key milestones that the policy, plan, project or programme (PPPP) should achieve.
- Identify who is responsible for delivering the milestones of the PPPP.
- Identify how the plan is going to be communicated to those delivering the plan and those affected by the PPPP.
- Involve stakeholders from previous stages in the planning and subsequent delivery phases, where appropriate, to build ownership.
- What are the key lessons emerging from the IDEAS, SURVEY, ASSESS and PLAN stages thus far? Use the suite of indicators developed in the Ideas phase to help.

Key questions and tools

- What is the value of ecosystem services in the area of the policy, plan, project or programme (PPPP)?
- Use the [Ecosystem Assessment tool](#) (p.84-85)
- Which survey techniques should be employed, considering the requirements of the PPPP and available resources?
- Consider using the [Engagement tools](#). Focus on reviewing secondary data sources first from your own organisation and other stakeholders before embarking on costly primary data collection.

²⁵ <http://www.eatme-tree.org.uk/studies.html>

²⁶ <http://www.eatme-tree.org.uk/plan.html>

- What are the evidence requirements for identifying the location, state, value and resilience of ecosystem services most affected by the PPPP?
- Where necessary, use the [Ecosystem Mapping tool](#) (p.85-87) as a baseline mechanism upon which to base future ecosystem assessments.
- What are the key lessons that you have learned during this stage?
- Keep a record of these for the EVALUATE stage.

Relevant case study narratives²⁷

- North Devon and Torridge Local Plan: the draft Local Plan provides a statutory framework for planning decisions over the next 25 years. It interfaces ecosystem services within the use and development of land (p. 111-114).
- Cotswolds AONB Management Plan: the revised management plan links actions to the management and enhancement of ecosystem services (p. 114-115).
- Greater Birmingham and Solihull Local Enterprise Spatial Framework: the draft plan provides an integrated framework for development of actions. Of particular note is the focus on boundaries between community, environment and economy (p.118-119).

10.7.4.5 DELIVER²⁸

This phase is about delivering the PPPP on the ground. It is crucial to translate and communicate the plan for the PPPP, to those bodies charged with its delivery. Ideally they should have been involved in shaping the previous stages as their local knowledge and experience represents a valuable resource. Failure to do this effectively may result in poor implementation. Common problems include a plan not being 'used' or simply rejected in favour of existing work practices. The plan may be too complex or not reflect the reality of the resources available for delivery. Indeed the 'messy' nature of reality will always present unforeseen difficulties for those who prepared the plan. This can necessitate a significant re-evaluation of the entire PPPP process assuming that feedback mechanisms are in place as part of on-going evaluation procedures. In other cases minor adjustments can be made as part of normal adaptation procedures. In so doing, it may prove useful to capture and record and share these adjustments and insights as part of your institutional memory for evaluation and for new users.

Key prompts

- Use the tools identified in the PLAN phase and consider consulting specific guidance and examples of good practice to help overcome unexpected difficulties.
- Liaise with those people on the ground delivering the plan to ensure satisfactory progress.
- What are the key lessons emerging from the IDEAS, SURVEY ASSESS, PLAN and DELIVER phases thus far? Use the suite of indicators developed in the IDEAS phase to help.

Key questions and tools

- Can a desired action be adapted to the situation on the ground?
- Are the planned outcomes being delivered?
- What can be done to ensure objectives are secured?
- How can you build in public engagement to your policy, plan, project or programme (PPPP)?
- Please note that we recommend that engagement should continue throughout all stages of the policy cycle.
- What are the key lessons that you have learned during this stage?

²⁷ <http://www.eatme-tree.org.uk/studies.html>

²⁸ <http://www.eatme-tree.org.uk/deliver.html>

- Keep a record of these for the EVALUATE stage.

Relevant case study narratives²⁹

- Exmoor National Park South West Water Proposed Payments for Ecosystem Services (p. 115-118).
- South Downs NIA (p. 119-222).
- Natural Resources Wales (p. 129-131).

10.7.4.6 EVALUATE³⁰

Context

Evaluation is never the final stage in a PPPP process; nor is it a separate bolt-on phase. It is an integral process that should be undertaken in all the preceding stages of the PPPP process. Ideally, evaluation steps should be identified at the outset in the IDEAS phase where success is defined and addressed with the identification of suitable indicators which should then be used and refined as the PPPP proceeds. In particular, there should be an attempt to identify indicators that cover all 12 principles of the Ecosystem Approach, set within the particular locational context. This maximises the chance of mainstreaming and achieving optimal outcomes through the PPPP. Our guidance crucially has also involved a universal ‘what lessons have been learnt’ prompt to ensure on going reflexivity and refinement as the PPPP evolves. Evaluation should include both qualitative and quantitative indicators where possible. It is also important to account of multiple user perspectives; reflexive self-assessment, other delivery agents and stakeholders perspectives, as well as views of those people (publics) most affected by the PPPP. It is dangerous to rely on quantifiable targets alone, although of course these have an important role to play. As revealed in our prompts, it is important to record the lessons learnt as the PPPP proceeds and initiate actions, in response, using adaptive management rather than waiting for an overall evaluation. In this way you can circumvent issues before they become problems.

Key prompts

- Have the key aims and objectives of the policy, plan, project or programme (PPPP) been met?
- How can the PPPP process and outcomes be improved?
- Is the evaluation capturing the right things?
- Are the right indicators being used that capture quality and performance for your PPPP?
- Are we capturing the views of those people most directly affected by the PPPP?
- What are the key lessons emerging from the IDEAS, SURVEY ASSESS, PLAN DELIVER and EVALUATE phases thus far? Use the suite of indicators developed in the IDEAS phase to help.

Key questions and tools

- Are you delivering what you set out to achieve?
- Review initial documentation.
- Are you meeting the needs of your key stakeholders?
- Consider Public Engagement and Futures tools.
- Are you evaluating the right things?
- Review the indicators used.
- What are the key lessons that you have learned during this stage?
- Keep a record of these for ongoing evaluation.

²⁹ <http://www.eatme-tree.org.uk/studies.html>

³⁰ <http://www.eatme-tree.org.uk/evaluate.html>

Relevant case studies³¹

- All case studies have a lessons learnt section. The most important lessons emerging are the need to:
 - involve stakeholders from the start of any PPPP and continue engagement over the whole process;
 - when using ecosystem services be pragmatic rather than idealistic but try and build ecosystem services into the evidence base;
 - the key tool, which is often forgotten, is the people managing the process on the one hand and also those who are charged with delivery. These are not always as joined up as they need to be;
 - avoid the tick-box syndrome in evaluation.

10.7.5 Tools within the Ecosystem Services Framework

As detailed in our methodology section we undertook a comprehensive review of policy tools that were used and most valued by our research team and case study individuals. These are detailed in **Appendix 2**. It is within the context of those review findings that we went on to prioritise tools which collectively were felt to have most impact in policy and decision-making and, which had most potential for use within an Ecosystem Services Framework. It was also important that the final suite of tools covered all components of our tool typology and performed across all stages of the policy cycle (**Table 10.10**). However, the final decision of which tools to include was pragmatic; the tool review process highlighted many suitable tools, but we were limited in the number of tools we could resource. In particular we recognised the potential of the Community Infrastructure Levy, Tax Incremental Financing and Biodiversity Offsetting, which ideally should form the basis of any further iteration of this project³².

Table 10.10 provides a summary overview of the tools that comprise our final toolkit. From the summaries of the tool profiles that follow we have identified the principal question that drives their use, together with the desired stage(s) at which they should be used within the policy cycle. Collectively, this reveals the importance of the IDEAS and SURVEY stages in optimising the benefits for any PPPP, regardless of the tools being used. Furthermore, if the goal is to mainstream an Ecosystem Services Framework, there is a need to build ecosystem services' tools explicitly into the SURVEY phase in order to establish a baseline assessment of ecosystem services from which any resulting PPPP can follow. Thus mapping tools for ecosystem services becomes increasingly important and, in our advice, we have produced various options to use: SCCAN, INVEST and LUCI.

In order to shed light on each of these tools we provide 2-3 page profiles which briefly summarise the scope and purpose of the tool, provide a case study example of the tool in operation and highlight the added value that the ecosystem services framework provides.

Table 10.11 provides a simple analysis incorporating TABLES team assessments showing how well our final toolkit takes account of the Ecosystem Approach in its wider use and application. There are marked biases apparent towards certain principles of the Ecosystem Approach at the expense of others. Whilst this represents a rather crude and subjective assessment from the TABLES core team, it reveals that public engagement (12), delegation (2) and long termism (8) were less explicit. Conversely, the tools currently favour the economic drivers (4), ecosystem resilience (5) and managing change principles (9)

³¹ <http://www.eatme-tree.org.uk/studies.html>

³² We also recognise that we missed off many tools from the initial review process. We never attempted to be comprehensive; rather we worked with the evidence we collected from our respondents.

Table 10.10. The suite of nine tools the NEAT Tree selected as most appropriate for embedding the Ecosystem Approach and advice on when to use them in decision-making

| Tool | Why should the tool be used? | When to use in the policy/decision making cycle |
|--|--|--|
| Strategic Environmental Assessment (SEA) | <ul style="list-style-type: none"> • Does my project, programme, plan, policy have any impacts on the environment? • Do I have to undertake a SEA as a statutory requirement under the EU Directive. • How can I have a better understanding of the way my plan or policy can be adapted to maximise environmental benefits and minimise environmental damage . | IDEAS and SURVEY to focus on scoping at outset of process and set within ecosystem assessment then onwards |
| Environmental Impact Assessment (EIA) | <ul style="list-style-type: none"> • Does my project or proposal have any significant impacts on the environment? • Does my project/proposal require an EIA as a statutory requirement under the EIA Directive? • How can my project can be adapted to maximise the environmental benefits and minimise the environmental damage? | IDEAS and SURVEY focus on scoping at outset of process set within ecosystem assessment then onwards |
| Payments for Ecosystem Services (PES) | <ul style="list-style-type: none"> • What are the key interdependencies affecting ecosystem services in my area of interest? • Who are the providers of ecosystem services (in the area and beyond)? • Who are the recipients (beneficiaries) of ecosystem services? • Who is benefitting and who is losing from the current spatial extent and quality of ecosystem service(s)? | SURVEY stage onwards |
| Cost-Benefit Analysis (CBA) | <ul style="list-style-type: none"> • Does my project or plan have conflicting views as to its need or value? • What are the benefits versus the costs of the proposed Programme, Plan Policy or Project? | SURVEY stage onwards - links into SEA,EIA and EA processes |
| Corporate Ecosystem Valuation (CEV) | <ul style="list-style-type: none"> • What are the major risks to my business from a changing environment? • What are the major business opportunities making use of ecosystem services? • How can my business embed ecosystem services into its strategic operational planning and performance systems? | IDEAS stage onwards |
| Ecosystem Assessment (EA) | <ul style="list-style-type: none"> • What is the state, condition and value of ecosystem services produced and/or consumed in my geographical area? • To what extent are ecosystem services imported or exported and how does the provision of ecosystem services change in the future? | IDEAS stage onwards |
| Ecosystem Mapping/SCCAN | <ul style="list-style-type: none"> • What ecosystem services are key in my area and what are their condition? • Where do the services originate and 'flow'? • Where are opportunities for multiple benefits from these ecosystem services? • Where are the users benefitting from these services (local and/or elsewhere)? | SURVEY stage but may need updating/ reviewing as part of EVALUATION - links with Ecosystem Assessment |

| | | |
|--|--|----------------------|
| Futures/Scenarios | <ul style="list-style-type: none"> • What kind of area/development/future do we want? • How might our PPPPs impact on the environment in the future? • What are the implications of current trends on ecosystem services in the future? | IDEAS stage onwards |
| Natural Capital Asset Check (Via WP1) | <ul style="list-style-type: none"> • What ecosystem services do we get from environmental assets now, • What might ecosystem services might we get in the future? | SURVEY stage onwards |

Table 10.11. Overview of Ecosystem Approach Principles addressed in the TABLES Toolkit

| EA PRINCIPLE ☐ | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | Approach Taken to Mainstreaming | | |
|--|---|---|----|----|----|----|----|----|----|----|----|----|---------------------------------|---|---|
| TOOLS ☐ | | | | | | | | | | | | | | | |
| STRATEGIC ENVIRONMENTAL ASSESSMENT | * | | ** | ** | ** | * | ** | * | ** | * | ** | * | Embed ES | | |
| ENVIRONMENTAL IMPACT ASSESSMENT | * | | ** | ** | ** | * | ** | * | ** | * | ** | * | Embed ES | | |
| PAYMENT FOR ECOSYSTEM SERVICES | * | * | * | ** | ** | * | * | * | * | ** | * | | Retrofit ES and EA | | |
| ECOSYSTEM ASSESSMENT | * | * | ** | ** | ** | ** | * | * | * | ** | ** | * | Embed ES | | |
| ECOSYSTEM MAPPING | * | * | * | * | * | | * | | * | * | ** | * | Embed ES | | |
| COST BENEFIT ANALYSIS | ** | | * | ** | * | * | * | | * | * | * | * | Retrofit ES | | |
| FUTURES | ** | * | * | ** | ** | ** | ** | ** | ** | * | * | * | Embed ES | | |
| COPORATE ECOSYSTEM VALUATION | ** | * | * | ** | ** | * | * | ** | ** | * | ** | * | Retrofit ES potential | | |
| <p>Summary of the 12 Principles of the Ecosystem Approach</p> <table style="width: 100%; border: none;"> <tr> <td style="width: 50%; vertical-align: top;"> <ol style="list-style-type: none"> 1. Promote societal choice using transparent and equitable processes and tools (11) 2. Delegate decisions to the most suitable scale (5) 3. Assess adjacent effects (12) 4. Incorporate economic and social drivers (17) 5. Encourage ecosystem resilience (15) 6. Respond to uncertainty in environmental limits (10) </td> <td style="width: 50%; vertical-align: top;"> <ol style="list-style-type: none"> 7. Operate at and across multiple spatial and temporal scales (12) 8. Champion a long-term approach (9) 9. Manage change to best advantage (13) 10. Champion biological diversity (11) 11. Optimise evidence from multiple sources (14) 12. Maximise and maintain stakeholder engagement (8) </td> </tr> </table> | | | | | | | | | | | | | | <ol style="list-style-type: none"> 1. Promote societal choice using transparent and equitable processes and tools (11) 2. Delegate decisions to the most suitable scale (5) 3. Assess adjacent effects (12) 4. Incorporate economic and social drivers (17) 5. Encourage ecosystem resilience (15) 6. Respond to uncertainty in environmental limits (10) | <ol style="list-style-type: none"> 7. Operate at and across multiple spatial and temporal scales (12) 8. Champion a long-term approach (9) 9. Manage change to best advantage (13) 10. Champion biological diversity (11) 11. Optimise evidence from multiple sources (14) 12. Maximise and maintain stakeholder engagement (8) |
| <ol style="list-style-type: none"> 1. Promote societal choice using transparent and equitable processes and tools (11) 2. Delegate decisions to the most suitable scale (5) 3. Assess adjacent effects (12) 4. Incorporate economic and social drivers (17) 5. Encourage ecosystem resilience (15) 6. Respond to uncertainty in environmental limits (10) | <ol style="list-style-type: none"> 7. Operate at and across multiple spatial and temporal scales (12) 8. Champion a long-term approach (9) 9. Manage change to best advantage (13) 10. Champion biological diversity (11) 11. Optimise evidence from multiple sources (14) 12. Maximise and maintain stakeholder engagement (8) | | | | | | | | | | | | | | |

The following sub-sections provide summaries for the tools that have been adapted to accommodate an ecosystem services framework.

10.7.5.1 Ecosystem Assessment (Ecosystem Services Typology)³³

What is Ecosystem Assessment?

An Ecosystem Assessment (EA), sometimes referred to as 'Ecosystem Services Assessment', can be defined as "an assessment of 'ecosystem health'" (Graham *et al.* 2012). The main aim of an EA is to inform decision-makers, but also other stakeholders, about the state and trend of ecosystems and the links between ecosystems and human wellbeing. The most prominent example for an EA is the MA (Millennium Ecosystem Assessment, 2005).

When and why would the tool be useful?

An EA is a decision-support tool informing a range of strategic decisions. One main aim of an EA is to generate general awareness about the value of ecosystem services and the trade-offs inherent in decisions affecting ecosystems for policy and decision-makers and other relevant stakeholders. The valuation of ecosystem services can, for example, inform budget allocations or the application of futures, regulatory, incentive and engagement tools in response to ongoing evaluations of policy.

What is its relevance to the Ecosystem Approach and ecosystem services?

Ecosystem services are an important part of this tool, however it is vital to avoid a pre-selection of ecosystem services, for example because some ecosystem services are assumed to be marginal or because they are difficult to assess. This can lead to the undervaluation or neglect of important ecosystem services which would undermine the purpose of an Ecosystem Assessment. The principles of the Ecosystem Approach should always be acknowledged when undertaking an EA. To make the outcomes most useful for the target audience, it is crucial to involve relevant stakeholders at all stages of the process. One of the main challenges of an EA is to involve all relevant sectors of society, including those that are usually not engaged in environmental policy and management. Local EAs, in particular, match the principle of decentralisation and the use of local knowledge. It is also important to clearly define the spatial and temporal scale of an EA; but also how to deal with cross-boundary issues and discounting future costs and benefits to society.

How does one work with the tool in practical steps?

The scope of an EA is not clearly defined and it can include different elements. It is usually an academic exercise - often including primary research - to provide relevant information about ecosystem services at the scale where it is most useful for the target audience. An EA can, for example, include an assessment of the value of ecosystem services, trend and scenario analysis, and mapping of ecosystem services. Based on such analysis, it also often includes recommendations and response strategies for decision-makers.

Wider considerations / good practice and pitfalls / case study

The Staffordshire Local Nature Partnership (LNP) has the vision to make Staffordshire a more prosperous and healthy environment to live in and believes that economic development can and must go hand-in-hand with protection of the County's important environmental assets. One priority objective identified by the LNP was to enable effective working partnerships between the environmental, economic, health and social sectors to improve decision-making and make the most of the green environment.

³³ <http://www.eatme-tree.org.uk/ecosystem-assessment-tool.html>

On behalf of the LNP, Staffordshire County Council has commissioned an Ecosystem Assessment for the geographical area of Staffordshire and Stoke-on-Trent. The main objective was to ensure that sectors, organisations and departments which are usually not involved in environmental management and conservation recognise the true value of ecosystem services and the importance of ecosystem services to their activities.

This Staffordshire Ecosystem Assessment incorporated the latest evidence and best practice from science and case studies with a focus on assessing the links and interdependencies between local functions and activities and ecosystems as well as the (monetary) value of ecosystem services 'produced' in Staffordshire.

10.7.5.2 Ecosystem Mapping Tool Review (Ecosystem Services Typology)³⁴

What is ecosystem mapping?

The primary purpose of ecosystem mapping is to identify which parts of the natural system are important for the supply of ecosystem services. The process of developing maps helps to identify the value of natural components of these systems (such as woodland, wetland or green infrastructure). More advanced ecosystem mapping visualises the flow of benefits (or disbenefits) from ecosystems to human populations, feeding into valuation work and for targeting interventions to address needs. Maps will change as conditions change, either through natural or managed processes, and can both document these changes and can help to anticipate consequences. Finally, maps provide an intuitive means for communicating what can often be quite complex (and unfamiliar) information about ecosystem services to a broad range of people. An example of an ecosystem map using the Polyscape approach is provided in **Figure 10.12**.

How does it work?

Ecosystem Mapping has a wide number of potential applications and, as such, there is no generic prescription available for generating maps. This makes the process of generating maps difficult for many users. Key issues that may affect this process include: variations in how individual ecosystem services are mapped (including availability of appropriate methodologies, indicators and expertise); identification of appropriate scale to map clusters of ecosystem services (which often have different system boundaries); availability, resolution and precision of data and variability in map function and audience requirements.

Initial maps are generated for each ecosystem service. Ideally this would include all ecosystem services but in practice is often narrowed down to key services (usually between one and six). This may involve using established methodologies (for example mapping impacts of tree cover on urban heat islands) or it may require development of new or customised methods depending on a number of factors (map function, data availability, available expertise, cost and scale). Generating maps for each ecosystem service will have different data requirements. In some instances data generated for other purposes can be used (with caveats), but in many instances data will not be available – particularly socio-ecological data. In many instances proxies can be used (although limitations should be made clear). At present we tend to see a bias towards services that are 'easier' to map (for example carbon sequestration, recreation and food production). These gaps can be partly addressed by using participatory mapping approaches – where local people and experts work in close partnership to co-develop maps. Once maps for individual services are generated then these can be used to develop composite maps visualising interactions between ecosystem services; important for identifying areas of synergy (hotspots) or areas where services are required to meet needs.

³⁴ <http://www.eatme-tree.org.uk/ecosystem-mapping-tool.html>

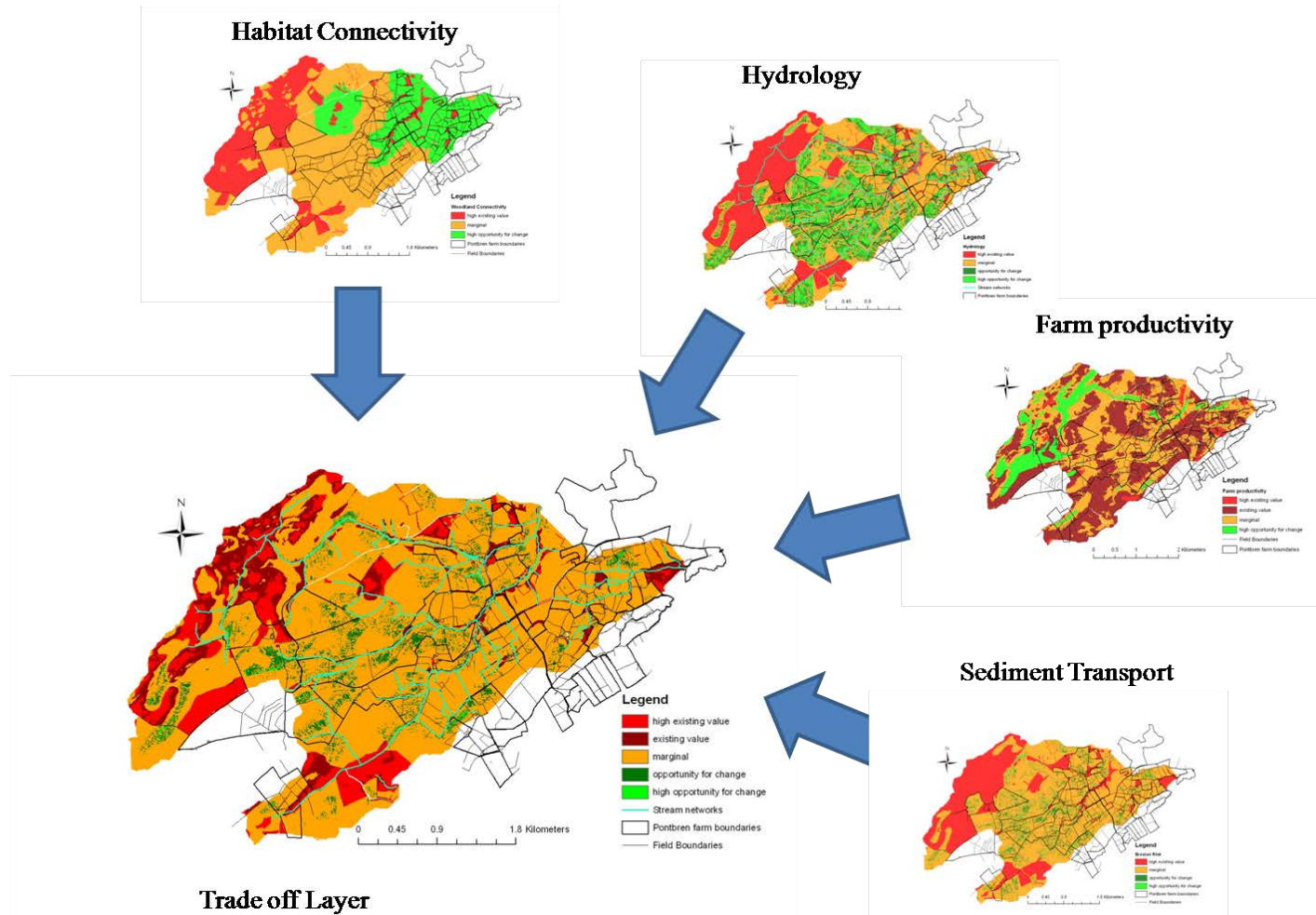


Figure 10.12. Example of ecosystem mapping using the Polyscape Approach. (Source: Jackson *et al.* 2013).³⁵

³⁵ The maps represent trade-offs and synergies of the impacts of tree cover between four ecosystem services at Pontbren farms in Mid Wales. On the individual maps the red areas represent high value for the service and green areas opportunities for change. In the combined map the red areas represent trade-offs whilst green areas represent areas where changes will provide multiple benefits.

What decisions is it used for?

Maps are important across the spectrum of activities associated with the Ecosystem Approach and are fundamental to Ecosystem Assessments. At a basic level maps allow planners to identify where stocks of natural capital (such as woodlands, lakes or green infrastructure) within a specified system are important for delivering ecosystem services. This may be at a range of scales (neighbourhood or farm, city/local authority, region and national). This informs basic valuation of these areas; particularly hotspot areas that provide multiple benefits. Mapping changes in land cover over time (either through historical mapping or through scenario mapping) can provide valuable information highlighting consequences of particular land-use changes or policy interventions.

Identification of 'flow pathways' between ecosystems and beneficiaries (enabling identification of winners and losers) is important for more precise valuation. This allows more targeted interventions and makes explicit trade-offs resulting from land use change. This is currently very challenging for most ecosystem services and some of the more complex models have only just begun to address this issue (for example ARIES).

The process of mapping should also provide information about the data needs. In most instances there is unlikely to be appropriate data available to map all ecosystem services so the process of developing maps will make this clear. As each ecosystem service has different data requirements some thought needs to be given to how different data sets relate to each other.

When is it used?

Mapping is a fundamental first step to ecosystem services management. Holistic understanding of the benefits that nature provides depends on clear identification of where (and when) ecosystems functions are generated and where these benefits are received (i.e. the point at which functions become services). While there are a number of mapping approaches/tools that can be applied relatively easily around individual ecosystem service (although these will not be badged as ecosystem service tools), ecosystem services mapping requires us to think about the interrelationships between these maps both for the same ecosystem service at different scales and between ecosystem services. This includes clear identification of not only which components are important (but information about their condition and understanding their relative value and associated uncertainties).

For valuation and strategic decision making exploring the impact of alternate scenarios more complex modelling approaches (such as ARIES and InVEST) may be required. These modelling approaches have limitations particularly around data requirements and modelling experience and may require customisation for specific locations. It is important that users are familiar enough with the models and the Ecosystem Approach generally to understand the limitations of these tools for decision-making. In addition, whilst maps are powerful communication tools, the lack of data at present (particularly at finer scales) often forces the use of proxies. There can be problems with this which makes it important to communicate uncertainty (which can be challenging with visual tools). At present, given the significant data gaps, the process of developing ecosystem maps is often as important as the final products. Assessing data requirements for maps will identify key knowledge gaps. The process also requires different experts to work together (fostering interdisciplinary activity) and the use of local knowledge (both to inform and 'ground truth' maps). Building these collaborative partnerships will often encourage engagement with the decision-making process.

10.7.5.3 SCCAN (Ecosystem Services Typology)³⁶

³⁶ <http://www.eatme-tree.org.uk/SCCAN-mapping-tool.html>

What is SCCAN?

Natural Resources Wales' SCCAN (Natural Resource Planning Support System in Welsh) project aims to provide an ecosystem service mapping system which allows users to weigh up and set priorities for the many competing demands that are placed on the environment. The aim of the project is to provide decision makers with information about which areas provide what benefits and where the best areas are for improving ecosystem service provision. By supplying this information, it becomes easier for people to take a more integrated approach to their work and consider a wide range of ecosystem services when taking decisions about development or management.

When and why would the tool be useful?

The SCCAN mapping system identifies natural resources which supply ecosystem services, provide benefits to society and the economy and maintain ecological resilience. By providing this information the SCCAN project aims to make it easier for decision-makers to take ecosystem services into account and to start considering a more integrated management of the environment. Rather than aim to provide expert answers, the maps are intended to be used as part of a wider discussion, which brings in other types of information, such as local knowledge from stakeholders.

What is its relevance to the ecosystem approach and ecosystem services?

SCCAN adopts a neutral, spatial planning approach, essential in bringing together a wide range of stakeholders and interests. It needs to be recognised that technical inputs in the form of maps or economic estimates, are not going to provide final answers. But instead these inputs need to be designed to fit into a properly designed deliberative decision-making process. Ecosystem service maps such as the ones produced as part of the SCCAN project are value-neutral; the maps do not rate one service as more important than another, but – in line with the principles of the Ecosystem Approach – are intended to be used as a starting point for a discussion between decision makers and stakeholders on which services they think matter most in a particular area.

How does one work with the tool in practical steps?

Taking an Ecosystem Approach meant that the SCCAN project had to find ways to work around significant data gaps. It was decided at an early stage that the best way to approach this challenge was to develop a methodology that made the best use of established scientific knowledge and the datasets held by various organisations in Wales, but which is also transparent and allows for local input and a certain degree of flexibility. Instead of a “black-box method”, which delivers outputs without it being clear what they are based on or how reliable they are, the SCCAN project has set out every aspect of the methodology in detail. This makes it clear to users what the information is based on and what the potential areas of uncertainty or data gaps are.

Wider considerations / good practice and pitfalls / case study

The SCCAN project has been working with local authority planners, in Bridgend Council, to develop mapping products which meet their needs (**Figure 10.13**). Having access to maps which show a range of ecosystem functions allows planners to take informed decisions about built development and opportunities to develop green infrastructure. Understanding the way that flood water naturally flows through the landscape can point to opportunities for tree planting upstream of development. Mapping the distribution of local pollinating insects can uncover the hidden value to allotments of seemingly low value, rough patches of land. Opportunities for developing local green infrastructure come from putting layer of information together and showing sites where rare habitats can most easily be expanded to not only deliver biodiversity gain but also recreational opportunities, lower flood risk and safeguard carbon rich soils.

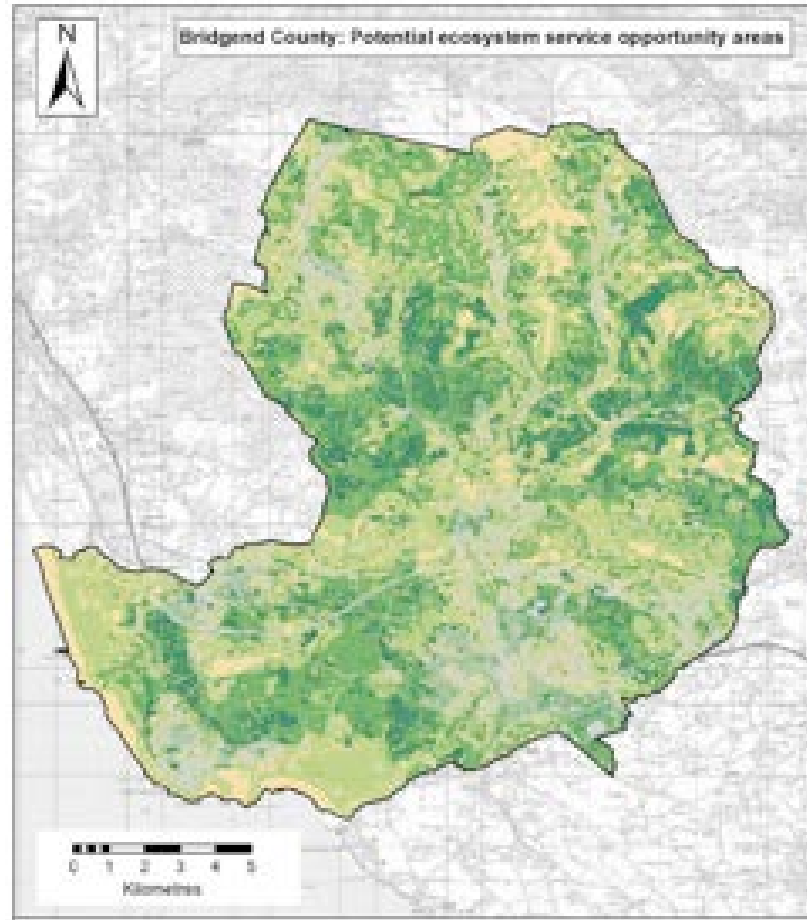


Figure 10.13. SCCAN: Ecosystem Service Opportunity Areas. (Source: Elliot and Elliot, 2012)

10.7.5.4 Natural Capital Asset Check (Ecosystem Services Typology)³⁷

What is Natural Capital Asset Check (NCAC)?

The UK Government is committed to Sustainable Development (SD), but this broad concept provides little guidance to decision-makers facing difficult trade-offs. To assess the impacts of our actions, we need to understand how the 'stock' of natural capital will continue to produce the 'flow' of ecosystem (and other) services over time. However, we lack a systematic method to assess this resilience and feed it into policy and decisions. The intention of a NCAC is to support such decisions by providing advice on: when, where and how natural capital assets are being used unsustainably; where action to protect and improve natural capital should be focussed for greatest impact on well-being; and, the research priorities that follow from these needs.

When and why would the tool be useful?

A NCAC analyses what society wants from natural capital – i.e. its performance. Its purpose is to to inform decision makers about how changes in a natural capital asset affect human wellbeing. As productivity of natural capital can have opportunity costs, optimal performance is not usually maximum performance. Policy targets (e.g. for maximum sustainable yield or maximum economic

³⁷ <http://www.eatme-tree.org.uk/NCAC-tool.html>

yield of fish stocks; carbon concentrations that avoid dangerous climate change; nature conservation targets) give indications of desired performance, but these can be conflicting and/or ambiguous.

What is its relevance to the Ecosystem Approach and ecosystem services?

Ecosystem services are embedded in the tool: NCAC provides a way of organising available evidence to give insights into thresholds and trade-offs by incorporating concepts of integrity, performance, red flags and sustainability. These need to be effectively understood if we are to manage natural capital optimally for society's long-term needs. Data on exactly where thresholds are is rarely available to inform decision-making, but observations of different examples of natural capital management can provide data on systems that are above and below thresholds (e.g. healthy and collapsed fish stocks). The consequences of crossing thresholds depend on environmental factors (e.g. speed with which productivity will recover) and economic factors (e.g. value of goods and services produced and substitutes available).

How does one work with the tool in practical steps?

The information a NCAC provides will be possibly most useful at strategic decision-making points, but can input in a variety of ways to:

- scope knowledge of an issue and understanding (can we answer the questions about sustainability?);
- analyse specific ecosystem services/capital relationship (e.g. pollination);
- analyse a discrete local site (e.g. large estuary);
- build a picture of complex choices on natural capital: in which case a number of iterations of analysis may be needed, starting with a large scale NCAC (like the majority of those in this project), from which critical areas of capital are identified. These could then be subject to further analysis of where capital is at risk of being used unsustainably, and these results could be fed back into the larger scale NCAC.

Wider considerations / good practice and pitfalls / case study

The uplands case study focused on the productivity of upland soils on regulating ecosystem services in order to make the analysis manageable. Clearly an analysis of all productivity from the natural capital of the uplands of England and Wales (which is a large scale and very varied piece of capital) would be a substantial undertaking, akin to a Government evidence review. Even if sufficient resources were available for such a review, it is unclear if a NCAC is manageable at such a scale in theoretical terms. For example, the complexity of synergies and trade-offs between services may render either analysis impractical or too generalised to give real insights.

The case study considered a peatland soil, which underpins the production of carbon regulation, water regulation and biodiversity services from various upland habitats. These habitats rely on peatland soils (as a natural capital asset) in combination with other natural capital assets in order to produce these final ecosystem services. The productivity of each of these services is a function of peatland soil extent and condition and other factors. Therefore it could be deemed to be a 'flagship' natural asset that reflects the integrity of the natural assets that combine to be productive.

10.7.5.5 Strategic Environmental Assessment (Regulatory Typology)³⁸

Introduction

Strategic Environmental Assessment (SEA) is a tool that allows decision makers to understand the impact of their plan or programme on the environment and how they can avoid or reduce any

³⁸ <http://www.eatme-tree.org.uk/SEA-tool.html>

negative environmental effects whilst maximising the opportunities presented by the natural environment. SEA is a legal requirement under European (SEA Directive 2001/42/EC) and UK law that requires certain public plans and programmes having potentially significant environmental effects to be examined in detail using the SEA process. SEA can help to answer the following policy questions:

- What are the likely and most important environmental effects, good and bad, of my plan or programme?
- What do the public and other stakeholders think of the environmental effects of my plan or programme?
- How can I reduce negative environmental effects?
- How can I make the most of the benefits provided by the natural environment?

What is Strategic Environmental Assessment?

Figure 10.14 runs through the SEA process and includes the key questions and challenges the SEA can tackle with respect to the consideration of ecosystem services.

Case study - Wild Deer Strategy

The strategy provided a long term vision for the effective management of wild deer across Scotland. The SEA process facilitated many elements of this, in particular providing a medium for cross-departmental and agency engagement. The SEA also sought to provide the opportunity to consider pertinent long term drivers and challenges. The top three drivers (climate change, land use change and public perception change) based on a combination of their importance and predictability were then subject to network (causal chain) analysis involving experts and stakeholders views. The completed causal chains provide a systematic and transparent means of understanding better how the Strategy might be implemented and also what the likely impact on the ground may be (**Figure 10.15** depicts the influences and impacts resulting from climate change). This process aided the identification and assessment of the potential environmental effects of the strategy as well as identifying various alternative management options whilst retaining its integrity as a strategic plan.

Added value of the Ecosystem Approach

- Ecosystem services reveal the multiple benefits we receive from the environment and applying this to SEA is a more accurate and effective way of understanding environmental impacts enhancing the potential to deliver more integrated and valuable outcomes.
- Ecosystem services reverse the idea that the environment is a constraint to development and instead recognises it as an asset. It allows consideration of how the environment supports delivery of a plan or programme and how the plan or programme can support this.
- Ecosystem services are part of the policy landscape, therefore an effective review of relevant plans, policies and strategies at the initial scoping stage should include policies and tools that are based on ecosystem services.
- The Ecosystem Services Framework is an integrating concept that can support assessment of cumulative effects. SEA supports the consideration of inter-relationships between topics.
- Ecosystem services incorporates resilience and risk reduction by ensuring a properly functioning natural environment, e.g. flood risk management plans rely on the storage capacity of green spaces.

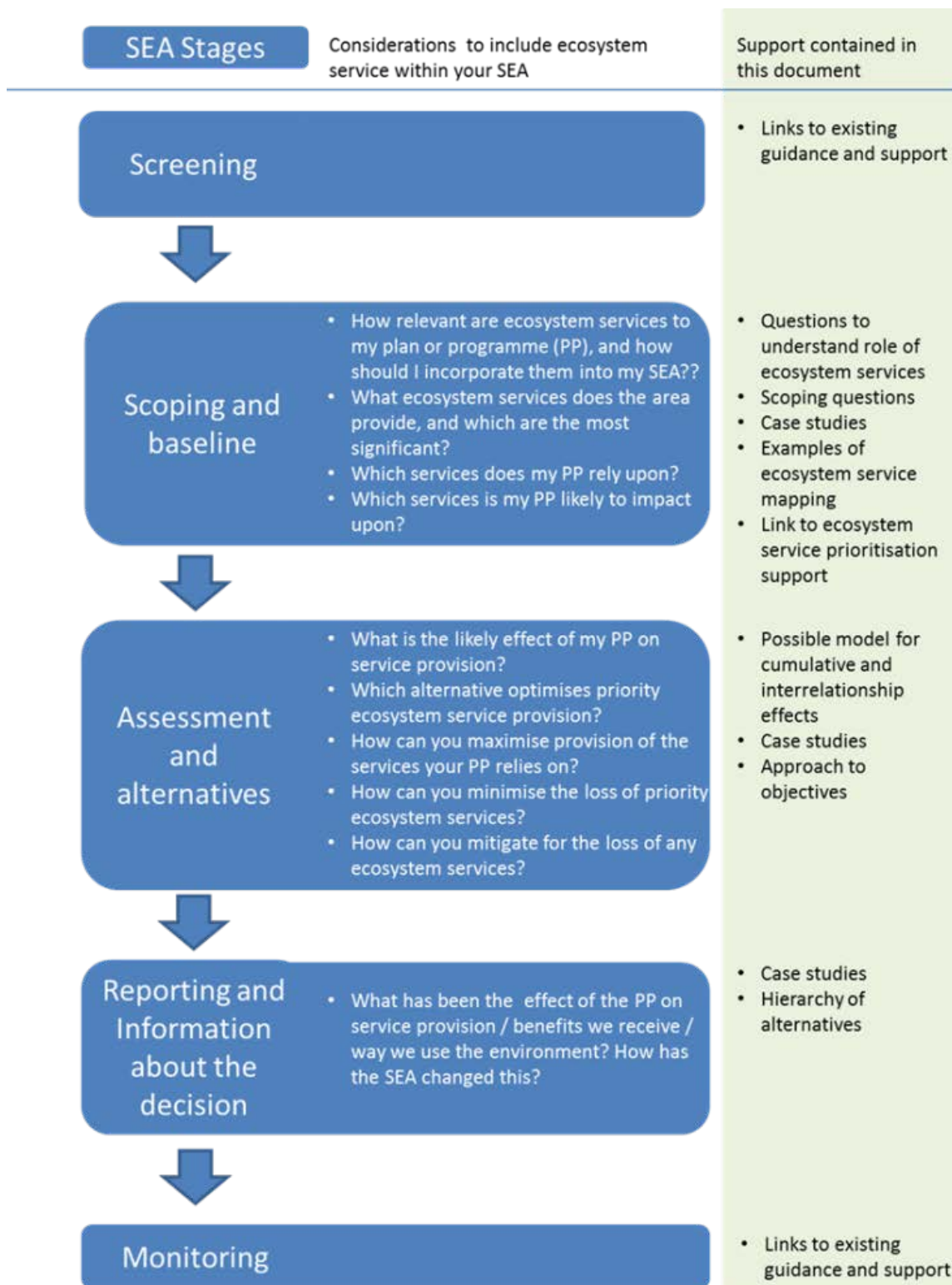


Figure 10.14. SEA process and ecosystem service considerations

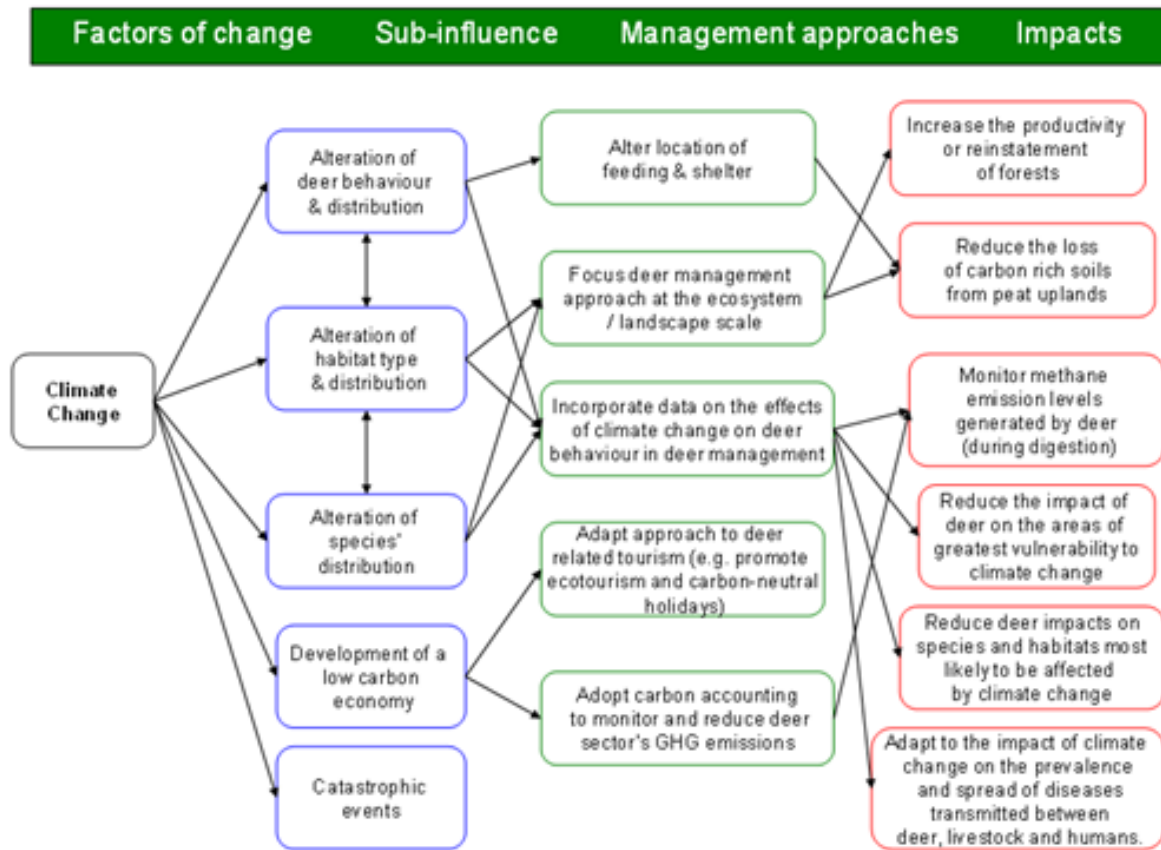


Figure 10.15. Wild deer management and ecosystem services, here showing the driver of climate change with its associated influences on management and impacts.

The wider use of the SEA tool

- **When?** Any policy, plan or programme will benefit from an SEA approach whether required by law or not.
- **Why?** Ecosystem services are an important resource in any location and the benefits gained from ensuring they are maintained and enhanced are significant.
- **How?** An SEA is already used to assess the environment of an area so the Ecosystem Approach will simply be an extension of the process to understand these services.
- **Who?** Developers, authorities, stakeholders and consultants are all involved in the process.
- **Where?** In any circumstance where there is need for a policy or plan intervention.

10.7.5.6 Environmental Impact Assessment (Regulatory Typology)³⁹

Introduction

Environmental Impact Assessment (EIA) is a tool that allows developers and decision-makers to understand the impact of a project on the environment and how they can avoid or reduce any negative environmental effects whilst maximising the opportunities presented by the natural environment. EIA is a legal requirement under European (Council Directive 97/11/EC) and UK law and requires that certain development proposals that are felt to have potentially significant environmental effects are examined in detail using the EIA process.

³⁹ <http://www.eatme-tree.org.uk/environmental-impact-assessment-tool.html>

What is Environmental Impact Assessment?

Figure 10.16 runs through the EIA process and how ecosystem services may be included. The schematic of the process includes the key questions and challenges the EIA can tackle with respect to the consideration of ecosystem services.

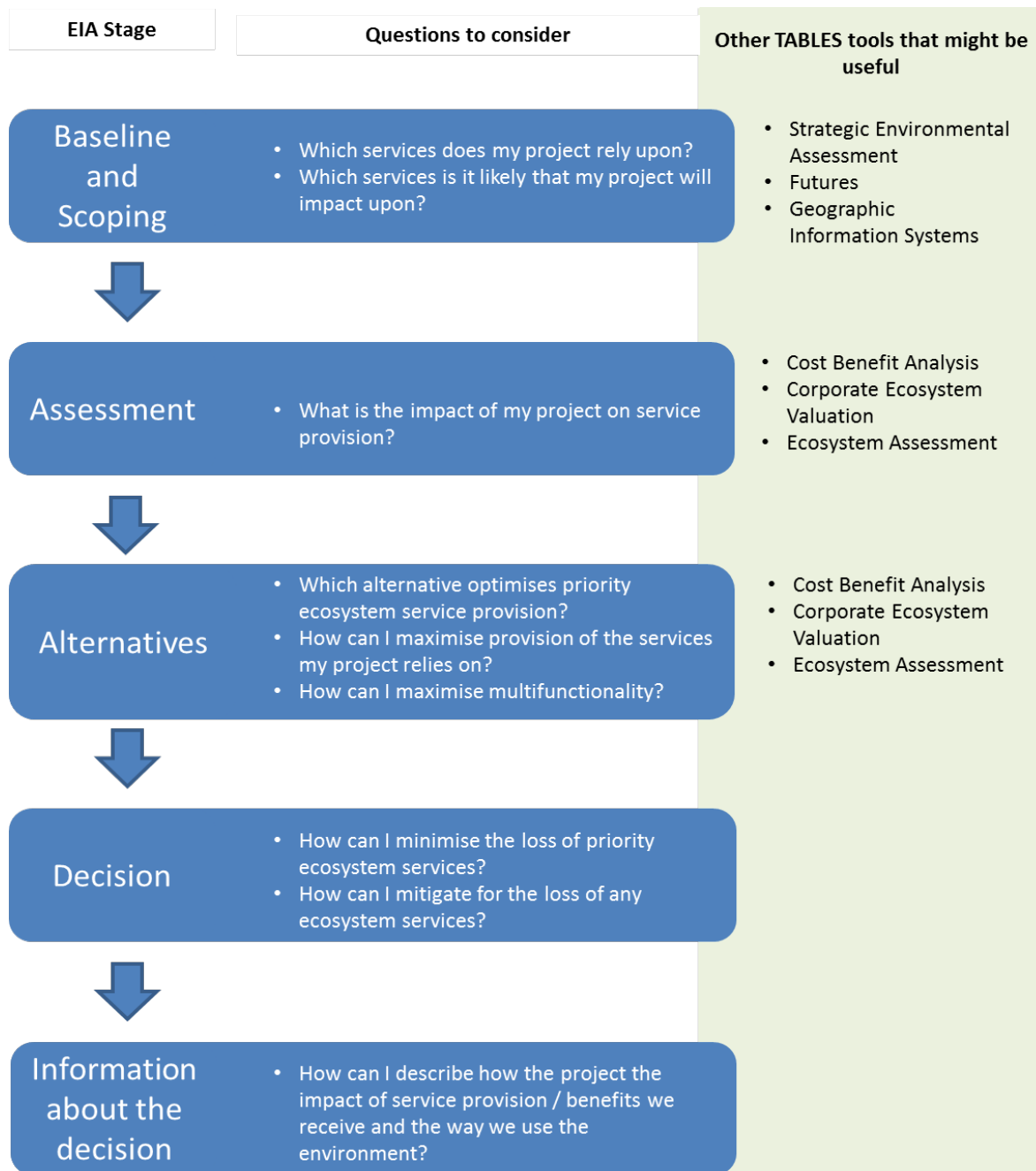


Figure 10.16. EIA process and ecosystem service considerations

Case study - Heysham Road EIA

A 2007 study examined ways in which an ecosystem-based approach could be applied to the retrospectively to an EIA of a link road development project. This study recommended that the concept of ecosystem goods and services should replace the more fragmented, topic-based approach taken by the EIA for the project, to maximise sustainability of the project for the long-term. Well-planned stakeholder participation is also crucial to identify the benefits arising from local

ecosystem goods and services, assess their 'value', and ensure that they are secured into the future. Furthermore, extending the scope of the EIA beyond the immediate siting of measures and infrastructure may be required to adequately map and quantify the supply and quality of ecosystem goods and services.

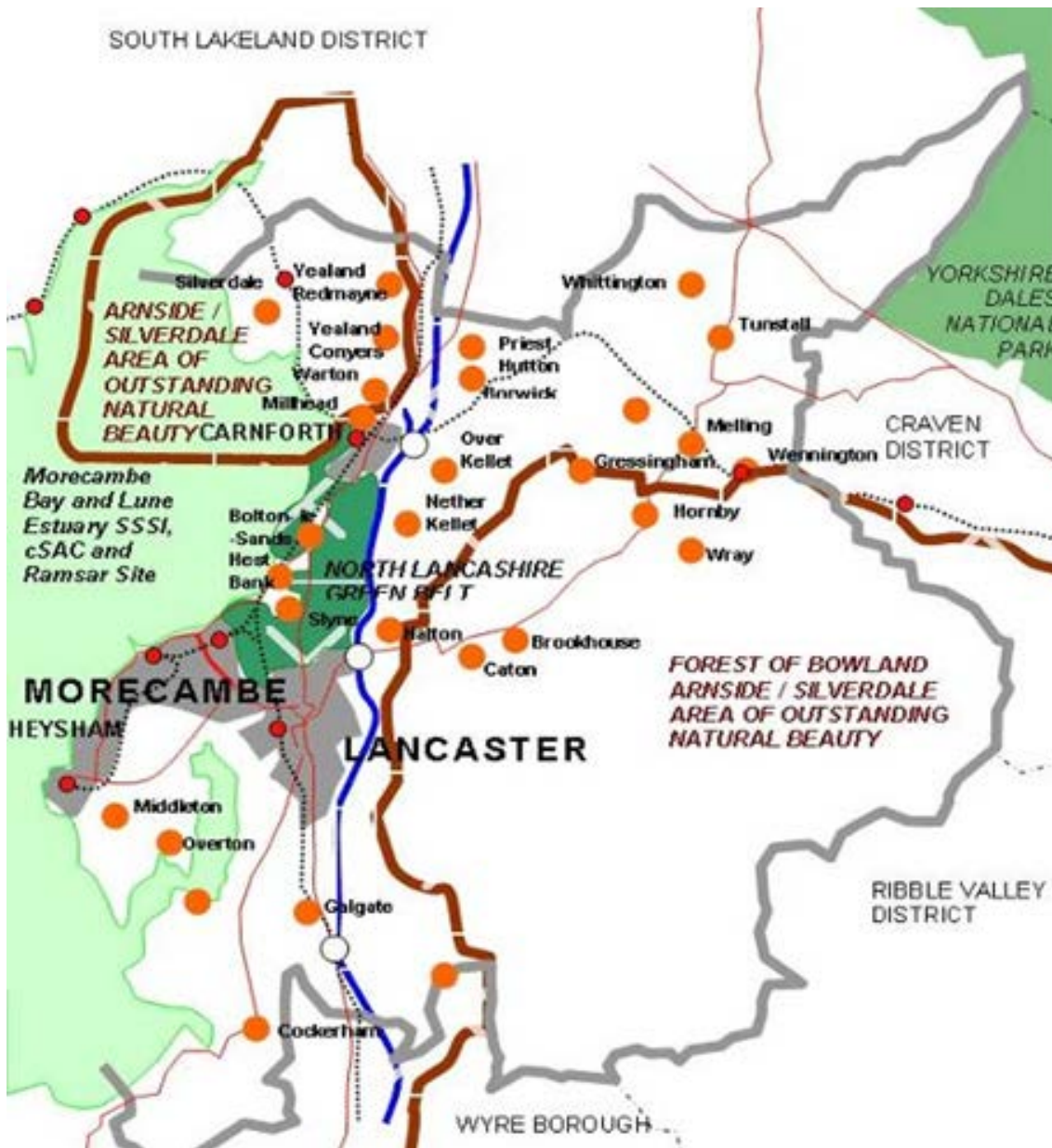


Figure 10.17. Location map of Heysham Road EIA]

Added value of the Ecosystem Approach

- Using ecosystem services in EIA explains to decision-makers why and where the environment matters.
- It allows a value (monetary in some instances) to be placed on the multiple benefits we receive from the environment thus alerting people to opportunities.
- By using ecosystem services, the idea that the environment is a constraint to development is reversed, as it considers the way that the environment supports the delivery of a project. This can lead to more resilient, effective and risk proofed projects.

- The Ecosystem Approach is an integrating concept and using an Ecosystem Services Framework can support assessment of cumulative effects consistently.

The wider use of the EIA tool

EIA is well established around the world covering issues as diverse as water quality and quantity, flood risk, biodiversity, carbon sequestration, valued landscapes and access for amenity. The following points along with the case study capture when EIA can be used.

- **When?** Any development or infrastructure project potentially qualifies for an EIA, case law and the Directive make these requirements clearer.
- **Why?** Ecosystem services are an important asset in any location and the benefits gained from ensuring they are maintained are significant.
- **How?** An EIA is already used to assess such things as the ecology of an area of land, so the Ecosystem Approach will simply be an extension of the process to understand related services.
- **Who?** Developers, authorities, stakeholders and consultants would all be involved in the process.
- **Where?** In any circumstance where there is an ecosystem affected by a project.

10.7.5.7 Payments for Ecosystem Services (Incentives and Ecosystem Services Typology)⁴⁰

What is Payment for Ecosystem Services?

The purpose of Payments for Ecosystem Services (PES) tools is to develop new markets for ecosystem services that have formerly been undervalued or overlooked. It is one of many tools that can be applied where the value of one or more services has been identified, where there are potential consumers of that service and providers. PES enables the beneficiaries (or prospective 'buyers') of that service to engage in dialogue with the owners or managers of habitats whose actions can protect or enhance the service for mutual benefit.

When and why would the tool be useful?

PES is a market-based approach founded on creation of markets linking the 'suppliers' of ecosystem services with their 'users'/'consumers'. Some services (mainly provisioning services) are already traded, including for example fresh water and food. However, most ecosystem services are external to today's market, yet are crucial for ecosystem resilience and supporting society's needs now and into the future (e.g. pollination and nutrient cycling). Valuation of these many formerly omitted ecosystem services is now essential for their effective incorporation into decision-making. Development of PES markets offers one means to recognise, internalise and protect these valuable services.

Added-value of the Ecosystem Approach

The process to establish a PES scheme can be a valuable process in terms of eliciting vital ecosystem services in their wider context and encourages long-term thinking through devising management incentives now to benefit the integrity and health of the ecosystem function. PES can be effective in bringing together stakeholders that may not usually converse and develop management strategies based on ecosystem science.

⁴⁰ <http://www.eatme-tree.org.uk/payments-ecosystem-services-tool.html>

How does one work with the tool in practical steps?

PES is well established around the world covering issues as diverse as water quality and quantity, flood risk, biodiversity, carbon sequestration, valued landscapes and access for amenity. Its potential uses are very broad and may appeal to many.

- **When?** The value of a particular service, or set of services, has been identified and the PES approach is cheaper than other means to secure it.
- **Why?** To create market mechanisms to secure or enhance service production.
- **How?** As a flexible mechanism within which specific tools are developed with all affected parties to realise a market value for environmental resources and services.
- **Who?** Key relevant parties are: (1) potential service users/beneficiaries, (2) service producers/protectors, (3) brokering of informing a potential market.
- **Where?** Wherever it is recognised that the continued provision and maintenance of an ecosystem service depends on specific management steps that can be better guaranteed if a (contractual) payment system is established and where there is a clear pathway from cause to effect.

Wider considerations / good practice and pitfalls

PES addresses only the market value of ecosystem services; the intrinsic value is not readily addressed. It is important that one target service is not protected or enhanced at the expense of other services and their associated beneficiaries, and that PES fits within wider strategies and societal agreements, even where cemented as a private market agreement.

Case study

'Thinking Upstream' (www.upstreamthinking.com) is a programme of catchment-based water quality protection forming part of water industry investment by South West Water, the water service company for the south west of England. Under 'Upstream Thinking', land users are rewarded for their cost-effective impact on provision of cleaner water, as compared to the costs to water providers of cleaning up dirtier water downstream. PES agreements do not replace, but kick in as an addition beyond, mandatory requirements upon farm businesses. PES is central to the operation of 'Upstream Thinking', with the Westcountry Rivers Trust, an NGO, acting as a trusted intermediary between the water service company and the many land managers in target catchments with important surface water abstractions. Various economic tools are used to target payments, including for example reverse auctioning (where potential 'sellers' compete for funds to deliver catchment improvement benefits in the most cost-effective way).

The Ecosystem Approach is central to 'Upstream Thinking', safeguarding critical ecosystem services (physico-chemical water quality regulation, the supporting service of nutrient cycling, the provisioning service of fresh water, etc.) with co-benefits for a range of services (including habitats for wildlife, contribution to ecotourism, enhanced fisheries, etc.). This is achieved by setting the services in an economic context in living landscapes and ensuring the participation of key stakeholder groups in scheme design and operations within catchments. OFWAT, the economic regulator of the water industry, accepts that there is a 65:1 benefit ratio relative to the costs of 'cleaning up' more contaminated water at the point of abstraction in 'Upstream Thinking' target catchments. This economic benefit ratio is purely for the focal service of fresh water, with wider catchment enhancement and its associated ecological, cultural and other benefits not factored in. The cumulative value of this broad range of co-benefits is far larger. 'Upstream Thinking' represents a significant change in the way the UK water industry has previously operated, and been regulated, requiring persistence on the part of the water company and NGOs to champion the approach through the political process. However, lessons in terms of net societal benefit (for wider services)

and targeted economic benefit are clear. These lessons have generic relevance to water industry investment, much of which remains narrowly focused.

Useful links

Defra's (2013) [PES guidance](#)

10.7.5.8 Corporate Ecosystem Valuation (Valuation and Ecosystem Services Typology)⁴¹

What is Corporate Ecosystem Valuation?

Corporate Ecosystem Valuation (CEV) has been introduced by the World Business Council for Sustainable Development in 2011 (WBCSD, 2011a). It serves corporate decision-making by identifying and valuing ecosystem impacts by businesses together with the risks and opportunities businesses face from changing ecosystem services. In a CEV, the benefits and value of the ecosystem services a company depends on, and affects by its actions, are assessed to guide the company's decision-making.

When and why would the tool be useful?

The application of CEV depends on the purpose. If applied for example to a project or process design, it should be applied at the earliest stage of the decision-making cycle to allow an optimal product/process design. But it can also be used to evaluate the impacts of products, projects or an incident in which case it would be applied at the evaluation stage of the decision-making process. CEV can also inform risk assessments anytime.

What is its relevance to the Ecosystem Approach and ecosystem services?

CEV has a direct focus on ecosystem services: it is important to apply the ecosystem services framework, for example adopted from the UK National Ecosystem Assessment (UK NEA, 2011a, b). This is to avoid a pre-selection of ecosystem services, for example because some ecosystem services are assumed to be marginal or because they are difficult to assess. A pre-selection can lead to undervaluation or neglect of important ecosystem services relevant to corporate performance. A CEV can focus on specific ecosystem services, but the selection of most significant ecosystem services should be part of a CEV itself (see WBCSD, 2011a).

The principles of the Ecosystem Approach should always be acknowledged when undertaking a CEV. It is for example crucial to involve relevant stakeholders at all stages of the CEV. Ecosystem services are not only affected and used by one business, but usually also by other stakeholders. Identifying and involving such stakeholders strengthens the outcomes of a CEV, but may also allow the business to make use of specialised knowledge and expertise which may not be available internally to the business. It is also important to clearly define the spatial and temporal scale of a CEV and to incorporate cross-boundary issues and discounting future costs and benefits to society. This becomes increasingly important as businesses have global impacts in the use and management of their activities.

How does one work with the tool in practical steps?

In general, CEV can be applied to a business as a whole, but also products, services, projects, assets, or an incident. As the name suggests a CEV includes the (monetary) valuation of ecosystem services relevant to the business. CEV depends on existing valuation techniques such as the revealed preferences method, the stated preferences method, the benefit transfer approach, or valuations based on expert judgement. Usually CEV has two main elements. On the one hand CEV shall provide

⁴¹ <http://www.eatme-tree.org.uk/CEV-tool.html>

corporate decision-makers with better information about the risks and opportunities arising from changing ecosystem services. It basically evaluates which ecosystem services are most important for the business performance and how such ecosystem services are projected to change in the future. The main question is how changes in ecosystem services provision will or can affect business success and how the enterprise can react. On the other hand CEV evaluates how business activities affect ecosystems and ecosystem services. Such an assessment reveals which ecosystem services are affected most (positively or negatively). This can, for example, help to target actions to mitigate negative impacts, to compensate for them, and/or to implement the value of affected ecosystem services into business accounting and reporting.

Wider considerations / good practice and pitfalls / case study

Because CEV is a comparatively new tool, applications and case studies are rare, especially in the UK. However, when developing the CEV tool guidance (WBCSD, 2011a), a range of businesses have 'road tested' the tool. One of them is Eka Chemicals, a business unit with AkzoNobel and one of the world's leading manufacturers of bleaching and performance chemicals for the pulp and paper industry. They applied CEV to compare the societal costs of atmospheric emissions for three alternative chemicals used in paper production. Benefits transfer was used to assess the value of externalities caused by greenhouse gases, SO₂, NO_x, VOC, dust and ammonia released in the life cycle from cradle to delivery at paper mill.

The CEV has revealed significant differences in the external costs between these products. Eka Chemicals commented that they can use such advanced information to undertake Cost-Benefit Analysis for the evaluated chemicals and to improve product and process development related to these chemicals. The information may also be implemented in their risk assessment to better manage reputational risks and opportunities (WBCSD, 2011b).

10.7.5.9 Social Cost Benefit Analysis (Valuation and Ecosystem Services Typology)⁴²

What is Cost-Benefit Analysis?

Cost-Benefit Analysis (CBA) is one of the most widely used decision support tools in the UK. There are two types of CBA, private and social. Private CBA focuses only on costs and benefits to a business and is focussed on profit maximisation. In contrast Social Cost Benefit Analysis (SCBA) focuses on raising aggregate social welfare and is a requirement for many decisions in central government. This guidance note focuses on SCBA only.

How does it work?

It is used to compare two scenarios, one without the proposed change (POLICY OFF) and one with the proposed change (POLICY ON). Once the differences between these two scenarios have been ascertained economic values are estimated for the differences. These include both costs and benefits. The project is desirable if the benefits of the proposed *change* from POLICY OFF to POLICY ON are greater than the costs.

What decisions is it used for?

It is best used to make decisions around specific proposals for investment projects or programmes, expenditure or legal regulations. When used for more strategic and less specific decision making the analysis can become intractable and the advantages of this approach diminish.

⁴² <http://www.eatme-tree.org.uk/SCBA-tool.html>

When is it used?

Government guidance calls for it to be used at every stage in the policy cycle, from the initial scoping phase, through to appraisal and evaluation. In practice its use in initial scoping and evaluation are limited, which reduces its potential to inform decisions. Also, a significant proportion of government spending is driven by politically decided targets rather than SCBA. SCBA is most use when applied to a specific and genuine decision which needs making, but outside government it (or parts of it) are sometimes used to make the case for a specific approach. SCBA's high status has a decision support tool makes it useful in this way.

Incorporating an Ecosystems Approach into SCBA.

Ecosystems Services Framework: In principle, SCBA should include all the significant consequences of a decision, including those relating to environment change. This is because, unlike market indicators such as Gross Domestic Product (GDP), SCBA includes non-market effects that impact on welfare, such as air quality or the view of a landscape from the window. In practice, environmental impacts have not historically been included as routinely or effectively as other impacts, particularly market ones. This may be due to ignorance by the analyst that they may be significant enough effects to include or difficulties in quantifying the effect, which tend to marginalise impacts in SCBA. Government economists have been working to improve this situation and there is now guidance to screening for and including environmental impacts, which explicitly uses the Ecosystem Services Framework.

Ecosystem Approach: Using the Ecosystem Services Framework to include environmental change in SCBA is a big step forward, but it is not in itself enough to fully adopt the Ecosystem Approach (EA). This is because of the values and assumptions that are built into the SCBA methodology. For example, the Ecosystem Approach focuses on societal choice, whereas SCBA assumes the right decision is that which maximises the value to all the individuals added up, without further discussion or dialogue. Some economists are seeking to address this by using SCBA as input into a deliberative process. Another example is that the EA focuses on the importance of ecosystem functioning for sustainability. This is very difficult to include in SCBA due to the lack of certainty about the likelihood of environmental 'tipping points' and their causes and the inability of project-level tools to address strategic issues. Addressing the problem requires SCBA, and policy decisions, to be conducted in a 'safe space' delineated by an expert process, such as the being developed by the Natural Capital Committee. Finally, SCBA reduces the costs and benefits of future years by an agreed percentage per year, called the discount rate. The standard Treasury discount rate renders all but enormous impacts irrelevant after 25 years which is in tension with the Ecosystem Approach focus on long-term management. Testing the effect of alternative lower discount rates is therefore desirable and allowable according to Treasury guidance.

Case study - valuing the ecosystem service benefits of Torbay's trees

One of the significant barriers to include ecosystem service benefits in SCBA is the difficulty of getting hold of a robust enough scientific quantification of the benefits to value. For urban trees new possibilities arose in this area with the development of the I-Tree software. This programme provides quantitative estimates of some services based on a sample of urban tree species and sizes. The Tree Officer at Torbay Borough Council was interested in using I-Tree to value these benefits in order to highlight the value of investment in urban trees. He teamed up with an arboriculturalist and they conducted a sample survey of Torbay's trees to feed into the programme. A TABLES project team member then joined the team to ensure the economic analysis was robust.

The first challenge to address was that the I-Tree programme was parameterised for use in the US and we had to go through each ecosystem service to check which estimates would be sufficient

reliable in the UK. This removed saved heating and cooling costs from our estimate and left us with only carbon storage and sequestration and air pollution removal. The programme also needed data on the normal air pollution level which is difficult to source and required some assumptions. The second major challenge was that the programme not only produced quantitative estimates but also placed a dollar value on benefits, using a relatively crude method. Therefore for the analysis in Torbay physical estimates and UK standard practices were used, including values to produce a better (and higher) estimate of the value of trees. Finally the programme encouraged the user to compare the costs of looking after the town's tree stock in a year with the benefits in that year, a one year snapshot analysis. In terms of SCBA this is meaningless because it does not relate to an actual investment decision. To put this another way, the benefits in this year are based on investment over the last two hundred years and would flow whether any further investment was put in this year or not. An ideal SCBA would therefore compare scenarios from now with business as usual level of investment or enhanced investment. Unfortunately this was beyond the scope of the project, but instead indicative cost:benefit ratios were produced for individual trees. Finally the results were offered with two discount rates to demonstrate their sensitivity to the rate chosen.

Having conducted the analysis, ensuring it was communicated properly was a challenge. The results showed low cost: benefit ratios for some trees, for example at standard discount rates the worst performing tree, a Cherry had a cost: benefit ratio of 1:0.01 and the best performing tree, an Oak, had a ratio of 1:0.21. It is important to remember that this was based on considering only two of the many ecosystem service benefits offered by the trees. In general terms the project achieved its institutional aim of highlighting benefits offered by trees that are not normally considered, and provided a methodology others could follow. Due to the difficulty in quantifying many of the benefits offered by trees however, SCBA by itself is not an ideal tool. Instead it should be expanded through deliberative or weighted consideration of other benefits, as in Multi-Criteria Decision Analysis.

10.7.5.10 Futures Tools (Visioning, Foresight, Scenarios, Backcasting with Roadmapping, Wind-tunnelling)⁴³

What are Futures tools?

Futures tools help explore possible futures with experts and stakeholders at an early stage of a policy-making process (IDEAS; SURVEY and ASSESS 'data') such that decisions can be informed by likely outcomes under different future circumstances. This may be through Visioning what is desirable, defining a preferred future state and then considering how to get there (Backcasting with Roadmapping), considering different plausible trajectories (through Foresight and Scenarios) or testing plausible scenarios against set goals, potential stresses or threats (Wind-tunnelling). Futures tools are also germane to the decision-making and evaluation stages of policy and practice, and can help provide links throughout the policy cycle through use of a consistent framework and language. Futures research and policy tools include a range of usually expert-led approaches to explore future possible states. They are creative and exploratory tools rather than merely extrapolating from existing data. Consequently, expert-led futures tools lend themselves to, and benefit from, input by stakeholders and the public. Futures tools can draw on a wide range of other tools to inform Scenarios and associated narratives (e.g. ecosystem services assessment; GIS based modelling, policy appraisals of regulatory and incentive tools) and are best used in combination (e.g. visioning *plus* backcasting with roadmapping *plus* wind-tunnelling). Outputs from windtunnelling, for example applied to test how elements of a Vision or Roadmap might perform against a range of anticipated pressures or selected criteria, can inform a Strategic Environmental Assessment (SEA) or Sustainability Appraisal (SA) (e.g. by testing scenarios against SA/SEA criteria and assessing the

⁴³ <http://www.eatme-tree.org.uk/futures-tools-toolkit.html>

extent to which they achieve the principles of sustainable development) as well as to modify a preferred Vision or Roadmap to ensure that it is more 'future-proofed' with respect to uncertainty.

What challenges can futures tools help answer?

The further into the future one looks, the more uncertain the future becomes. Consequently, the value of 'planning' in any rigorous form deteriorates. Thus when looking over long timescales (let's say 20 years and beyond), visioning can help create a clearer idea of the conditions and context aspired to by society. Combinations of futures tools – for example backcasting, roadmapping and wind-tunnelling – can be valuable for assessing near to medium-term actions that are the least risky, and where there are likely to be bifurcations or break-points at which fresh assessments may be required.

What are the key issues of using futures tools within an Ecosystem Approach?

Using Futures tools explicitly within an Ecosystem Approach is rare. However, using the ecosystem services framework in Visioning and Scenarios processes does not necessarily require additional steps or processes and can be easily integrated into existing Foresight and Visioning exercises. As the ecosystem services framework is becoming part of the policy landscape, the relevance and plausibility of scenarios can be improved by adopting a similar ecosystem services lens and expressing actual/likely policy priorities to the full spectrum of ecosystem services, including implications for their many beneficiaries as well as potential losers. Applying an Ecosystem Approach in futures tools can strengthen considerations of resilience and risk reduction (e.g. examining ecological feedback processes and how likely changes in the environment may impact on the provision of goods and services, at various scales, in the different plausible scenarios, as well as better anticipating unintended trade-offs). Essentially, any Scenario, Backcasting or Roadmapping exercises for a specific place will consider net impacts on the natural environment and its multiple beneficiaries. The ecosystem services framework can aid the description of outcomes in scenarios and the interactions and interdependencies between different beneficiaries of ecosystems. Thereby, the ecosystem-based approach helps identify actions of mutual benefit and highlight issues that may require agreements to ensure the sustainable management and sharing of ecosystem resources. Importantly, the Ecosystem Approach facilitates integration and supports the assessment of cumulative effects and impacts across sectors and scales and, in doing so, can improve Foresight and Scenarios work.

Case study

Work supporting water allocation reforms in South Africa, replacing the top-down apartheid-era management regime with a new democratic and devolved structure, required a process of engagement of a wide range of formerly disconnected stakeholders within focal catchments to determine how best they would approach the task of sharing a common water resource (Colvin *et al.*, 2009). Awareness of the catchment context and of ecosystem services was fundamental to group working, serving as a common framework to articulate the benefits and aspirations enjoyed by, as well as the interdependencies between, all stakeholder groups.

Once consensus had been achieved within the catchment stakeholder group about a desire to work positively together, a visioning exercise exploring historic, current and desired future circumstances with respect to water management and sharing helped all stakeholders appreciate the close interdependencies of their varied livelihoods, the types of water management practices appropriate for meeting needs, and the economic and governance arrangements best suited to achieving sustainable management and sharing (Everard, 2013). In particular, a common focus on the shared ecosystem identified that collaborative co-management of a common ecosystem resource was essential if desirable services were to be protected or enhanced. Identification of this consensual

‘end goal’ helped the group work together to address current constraints to sustainable progress, and provided a basis for backcasting in order to test options for collaborative management. This in turn helped the group understand feedbacks between their uses of water and land, provision of water and steps necessary to secure sustainable management (Everard *et al.* 2009). The net outcome was agreement by the catchment group to form a Water User Association (WUA), one of the devolved management structures identified in South Africa’s National Water Act 1998. The process relied upon a patient process of trust-building to overcome former cultural barriers, with devolution of authority from local government also proving a significant obstacle.

What are the key lessons and issues to remember?

Scenario tools discussed here tend to work as a meta-tool in that a wide range of other tools can operate within futures work, in a nested fashion. Furthermore, Scenarios can play an important part in other tools. We recommend the use of futures tools in combination rather than stand alone to support decision-making. For example, wind-tunnelling is viewed here as a quick and valuable test for any of the Futures work rather than a tool used in isolation.

If applied with an Ecosystem Approach mindset, using the Ecosystem Services Framework will go beyond a change in language and affect the way a challenge is defined, approached and tackled. Applying the ecosystem services framework to Futures tools enables more explicit attention to the links between human activity and ecosystem services provision, including interdependencies between stakeholder groups and their uses and management of common ecosystem resources, essentially considering plausible cause-effect or impact pathways to inform decision-making. Considering the dynamic complexities of the environment is more effectively done through paying attention to processes, interactions and dependencies rather than describing a snapshot future state. Thus applying the ecosystem services framework to all forms of futures work can help explore more realistically the future wellbeing and adaptive capacity of both the environment and those dependent upon it.

10.7.6 Case Study Narratives: Delivering the Ecosystem Approach in Practice

A key part of our project involved an assessment of how well ecosystem science was being mainstreamed in practice. Our approach involved working with various case studies in different spaces and settings as they grappled with mainstreaming ecosystem science in practice. This fuelled our co-production ethic and allowed us to build up a dynamic evidence base of ecosystem experience which informed and grounded our resulting advice through the collective learning and sharing of lessons.

Table 10.12 summarises the principal case studies that we have worked with in depth and also highlights the key questions that each case study sought to address and the principal tools that were used⁴⁴. The results show the universal importance of ecosystem mapping, in some shape or form, as a key tool, reinforcing the need for an Ecosystem Services Framework to be established at the SURVEY phase in a PPPP to maximise mainstreaming potential.

The case study narratives have also been assessed in a similar fashion to the tools regarding the extent to which they address explicitly each of the 12 principles of the Ecosystem Approach (**Table 10.13**). This reveals that the majority of principles are addressed in some form but with a clear bias

⁴⁴ Please note that these tools were not our adapted tools. Rather these were tool that they had used in pursuit of their goals. Our project worked in parallel. It is important to note that perhaps the greatest parallel was with Natural Resources Wales given that we both were working to essentially identical aims.

towards societal choice (principle 1), economic and social drivers (principle 4) and ecosystem resilience (Ecosystem Services Framework, principle 5). Interestingly those principles overlooked were responding to uncertainty and limits (principle 6), long-termism (principle 8) and managing change (principle 9). The key finding is the variation in the adoption of these principles in practice which suggests the need for a more consistent and explicit approach to their use in evaluation processes within PPPs.

In order to capture the value and diversity of ecosystem mainstreaming in practice, the following section presents two-three page summaries of each case study highlighting its scope, how the ecosystem approach had been used, the barriers preventing further progress and the lessons learnt.

Table 10.12. Key questions and tools addressed in TABLES case studies.

| Case Study : | Key preliminary question shaping case study | Key tools used |
|---|---|--|
| SCOTTISH RURAL DEVELOPMENT PROG. – SEA | How can we structure the SDRP to maximise the environmental benefits? What policies are needed to manage ecosystem services effectively for the long-term? | SEA; FUTURES |
| NORTH DEVON/TORRIDGE LOCAL PLAN | How can we recognise the value of ecosystem services in a local plan? How can we adapt local policies and strategies to maintain/improve benefits from nature? | ECOSYSTEM MAPPING; FUTURES; ENGAGEMENT |
| GBSLEP | How can we develop a spatial framework for the LEP that maximises opportunities for economic growth? How can explicit attention to ecosystem services improve development strategies? | FUTURES; ENGAGEMENT; CBA |
| SOUTH DOWNS NIA | What ecosystem services does this area have and rely on? How can we manage the area better to maximise the benefits of ecosystem services for people (health & wellbeing; economic prosperity)? | ECOSYSTEM MAPPING; ENGAGEMENT |
| ISLE OF WIGHT AONB | How can we build the Ecosystem Approach into the Isle of Wight AONB management plan? | ECOSYSTEM MAPPING; ENGAGEMENT; SEA |
| COTSWOLDS AONB | How can we review our AONB management plan mindful of the benefits provided by ecosystem services? | ENGAGEMENT; FUTURES |
| BIRMINGHAM CITY COUNCIL | What is the value of Green Infrastructure to the residents and businesses across the city? How can the Council embed this information to improve its policies, plans and effective investment for different constituencies? | ECOSYSTEM ASSESSMENT; CBA |
| STAFFORDSHIRE LNP | How can we build the valuation of our environment into the work of the LNP and influence other partners? | ECOSYSTEM ASSESSMENT |
| MUCH WENLOCK NEIGHBOURHOOD PLAN | How can we develop a neighbourhood plan that best captures the views of our town and provides a positive forward planning document to deliver sustainable economic development? | FUTURES; ENGAGEMENT |
| EXMOOR South West Water | How can we develop a PES scheme between South West Water and the landowners in the catchment that maximises environmental benefits and reduces costs? | PES |
| NATURAL RESOURCES WALES | How can we operationalize an Ecosystem Approach in the work of Natural Resources Wales? | ENGAGEMENT; ECOSYSTEM MAPPING |

Table 10.13. TABLES case studies assessment by adherence to the Ecosystem Approach.

| CASE STUDY /EA PRINCIPLE: | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | Approach Taken to Mainstreaming |
|---|----|----|----|----|----|--|----|----|----|----|----|----|---------------------------------|
| SCOTTISH RURAL DEV. PROG. – SEA | * | * | ** | ** | ** | * | | * | * | * | ** | ** | Embedded ES |
| NORTH DEVON/TORRIDGE LOCAL PLAN | ** | * | ** | * | ** | * | * | * | * | * | * | * | Retrofit ES |
| GBSLEP | ** | * | * | ** | * | * | * | * | * | * | * | * | Retrofit ES and EA |
| SOUTH DOWNS NIA | * | * | | ** | * | * | * | * | * | ** | ** | ** | Embed ES |
| ISLE OF WIGHT AONB | | | | | | | | | | | | | |
| COTSWOLDS AONB | ** | * | * | ** | ** | * | * | * | | ** | * | * | Retrofit ES |
| BIRMINGHAM CITY COUNCIL | ** | ** | * | * | ** | | ** | * | * | * | ** | * | Embed ES |
| STAFFORDSHIRE LNP | ** | * | * | ** | ** | * | * | * | * | ** | ** | * | Embed EA and ES |
| MUCH WENLOCK NEIGHBOURHOOD PLAN | ** | ** | ** | * | | * | ** | * | ** | * | ** | ** | Retrofit ES potential |
| EXMOOR South West Water | ** | ** | | ** | * | | | | | | * | * | Embed ES |
| NATURAL RESOURCES WALES | ** | ** | ** | ** | ** | ** | ** | ** | ** | ** | ** | * | Embed EA |
| * Evident ** Significant ES = Ecosystem Services EA = Ecosystem Approach (X)= total number of * | | | | | | | | | | | | | |
| Summary of the 12 Principles of the Ecosystem Approach | | | | | | | | | | | | | |
| 1. Promote societal choice using transparent and equitable processes and tools (18) | | | | | | 7. Operate at and across multiple spatial and temporal scales (11) | | | | | | | |
| 2. Delegate decisions to the most suitable scale (14) | | | | | | 8. Champion a long-term approach (10) | | | | | | | |
| 3. Assess adjacent effects (12) | | | | | | 9. Manage change to best advantage (10) | | | | | | | |
| 4. Incorporate economic and social drivers(17) | | | | | | 10. Champion biological diversity (13) | | | | | | | |
| 5. Encourage ecosystem resilience (15) | | | | | | 11. Optimise evidence from multiple sources (16) | | | | | | | |
| 6. Respond to uncertainty in environmental limits (9) | | | | | | 12. Maximise and maintain stakeholder engagement (13) | | | | | | | |

10.7.6.1 Re-thinking the City of Birmingham from an Ecosystem Services Perspective⁴⁵

What is this case study about?

As part of the development of the City's Local Development Framework it was identified early on that the city would need a Green Infrastructure Strategy. This opportunity was exploited to take advantage of the latest scientific methodology developed through the UK National Ecosystem Assessment (2011), supported within the Natural Environment White Paper; by applying that approach to the whole city's network of green and blue infrastructure.

Where is this contextual setting?

Cities are still being understood and managed on twentieth century evidence and practices, at best; in certain areas still influenced by nineteenth century thinking. There are three significant factors that are now available to cities in the twenty first century, they should consider closely before making their future plans; they are:

- a new understanding of health and well-being and the role of stress;
- the significance of global climate change upon every locality;
- the fresh perspective brought by the science of ecosystem services.

How has the Ecosystem Approach been used?

One of the barriers to adopting an ecosystem services approach at a city scale has been the level of understanding required. Therefore a series of studies were undertaken, applying the ecosystem services methodology to six dominant urban issues and displaying these as GIS maps of the city. These six chosen topics were aesthetics and mobility, flood risk, local climate, education, recreation and biodiversity.

These were depicted as demand maps; so showing areas of high supply, low demand at one end of the scale; low supply, high demand at the other end of the scale (**Figure 10.18**). These six maps were then super-imposed into a single multi-layered challenge map for Birmingham. These maps can then be overlaid onto the street plan and reduced to district or neighbourhood scale, for more local, less strategic interpretation. So the maps can simply be accepted as evidence maps, and used as such by non-specialists; including community groups and the third sector, and easily understood by local Members.

Birmingham has declared a fresh ambition to become a leading global green city. Against this backdrop it established a Green Commission, who collectively agreed a new green vision. It was therefore possible to influence this group and get them to agree that a green vision for Birmingham had to be underpinned by adopting an ecosystem services framework; and that one of the key instruments to drive this through would be the Planning Framework.

What has happened?

Birmingham has established a cross disciplinary working group, who have brought together each of their evidences, their policies and their delivery plans. Collectively they were able to agree seven key principles that were cross-cutting and could form the backbone of the green infrastructure policy. These seven principles have then been locked into the overall planning framework for the city through the Birmingham Development Plan and the Sustainable Development Plan *Your Green and Healthy City*. The nine disciplines are Climate Science (University); Water; Biodiversity; Green Infrastructure; Sustainable Transport/Mobility; Planning; Community & Resilience; Business and

⁴⁵ <http://www.eatme-tree.org.uk/birmingham2.html>

Public Health. Their seven chosen principles are:- 1 An Adapted City; 2 The City's Blue Network; 3 A Healthy City; 4 The City's Productive Landscapes; 5.The City's Greenways; 6.The City's Ecosystem and 7.The City's Green Living Spaces.

What is the added value of the Ecosystem Approach?

- Green Commission endorsement of the Ecosystem Services Framework has brought huge added value to driving forward the city's green vision.
- Supply and demand maps offer a direct and tangible output as to what action is needed where and for what reason.
- Linking strategic ambition with local delivery, with human well-being as the outcome measure.
- Final multi-layered challenge map for Birmingham is composed of many layers, many issues, it is going to demand a multi-disciplinary solution.
- This is effectively 'the Trojan Horse'; to bring about change requires a joined-up approach.
- Applying the Ecosystem Approach brings together a wider range of stakeholders and potential budget-holders/investors.
- Local scale maps enable third sector and voluntary sector to make own funding bids.

What are the key barriers to progress?

- Most barriers overcome through linking initiative with the Green Commission and creating a cross departmental and cross stakeholder group; including Business and Community.
- On-going institutional and individual inertia to change between professions and sectors.

What are the lessons learnt?

- Strong and effective leadership to drive the change agenda through; keep going when initial obstacles are put in the way.
- Plan for the long term in policy terms, with a minimum of 10 years.
- Ensure all evidences are as accurate and as broad as possible.
- Be as comprehensive and inclusive as you can to build mutuality.
- Simplify complex science without diluting its impact.
- Tie all the work to Government policy and international best practice examples.
- Make the output of the project fit the required outcomes on-the-ground.
- Demonstrate who benefits and why, and make this as democratic as possible.
- Lock-in the proposed changes to existing and future city policy and spatial planning policy.
- Try and develop champions, all operating at different levels and across different communities of interest.

What next?

- Full Cabinet approval for the Green Living Spaces Plan, September 2013.
- Approval for adopting the seven key principles across the Planning Framework 2013-14.

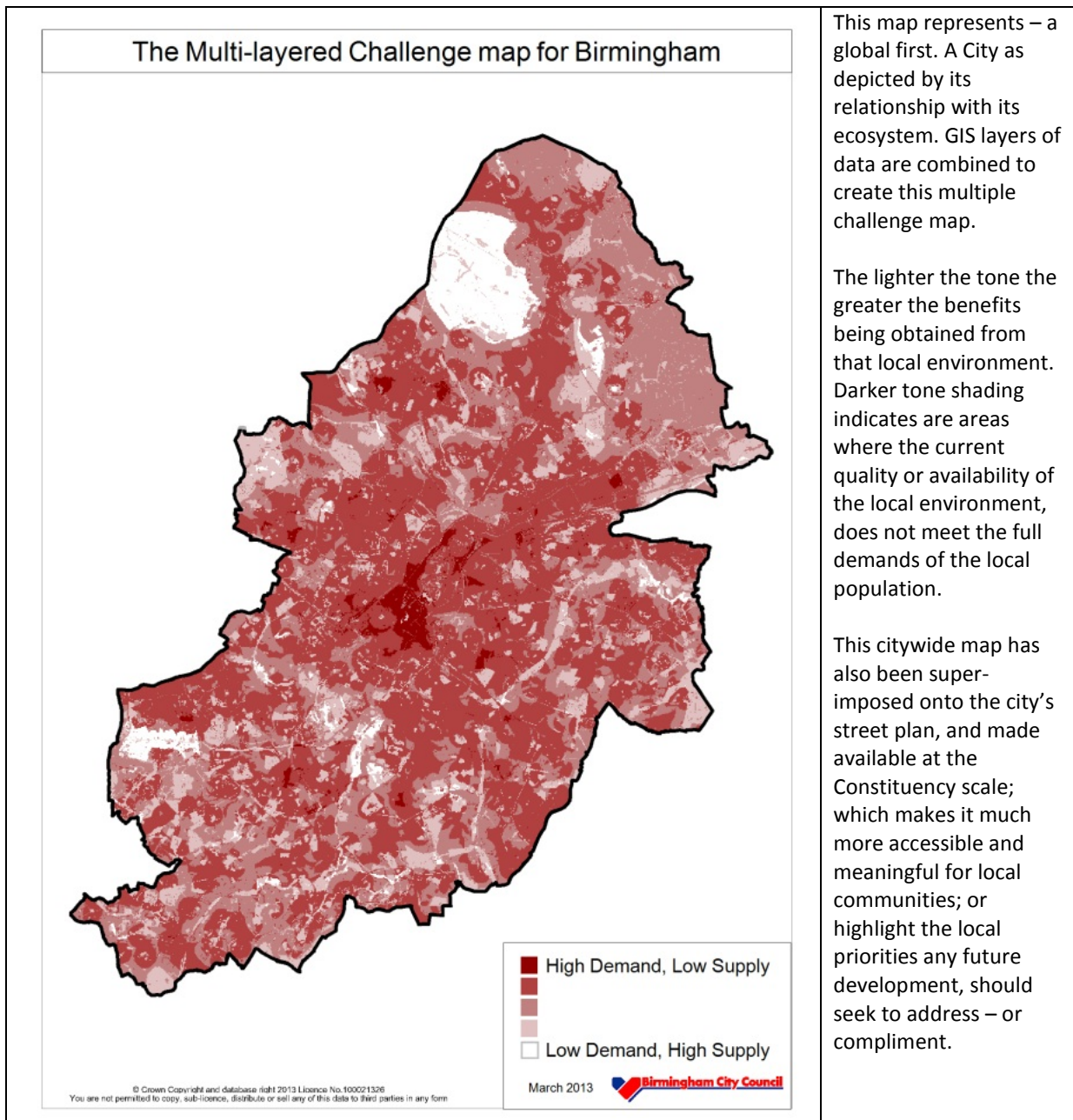


Figure 10.18. Birmingham Challenges for ecosystem services.

10.7.6.2 Much Wenlock Neighbourhood Plan⁴⁶

This case study is about planning at the local level and the potential to retrofit Ecosystem Approach and ecosystem services as a tool for evaluation.

What is this case study about?

The Much Wenlock Neighbourhood Plan has been prepared by the Town Council and members of the community to direct the scale, type and location of development for the parish over the next 13 years. The preparation of the Plan has been through the identification of ideas, extensive survey

⁴⁶ <http://www.eatme-tree.org.uk/wenlock.html>

work and gathering evidence through to the distillation of policy objectives and site allocations. It is currently before an Inspector undertaking assessment which will then trigger a referendum.

Where is this contextual setting?

The Plan has been prepared for a small market town within a wider rural parish. The town and parish has a high quality and historic environment; 2 conservation areas and partially within the Shropshire Hills AONB. Its attractiveness is enhanced by a broad mix of housing types, a medieval High Street with good local shops and both a primary and secondary school serving a wider rural area. It is located between the growth points of Telford, Shrewsbury, and Bridgnorth and is within commuting distance of the West Midlands conurbation. It is, as might be anticipated, under significant pressure from housing developers. The strategic policies for Shropshire set out in the adopted Core Strategy, provide the planning context and in practice the growth ambitions of Telford are equally relevant. The Town Council has become the neighbourhood planning authority and formally driven the Plan whilst Shropshire Council has enabled the progression of the Plan.

How has the Ecosystem Approach been used?

The Plan has been prepared without explicit use of the ecosystem approach or ecosystem services due to perceived barriers of jargon and lack of group familiarity with the concepts; the Natural Environment White Paper and National Planning Policy Framework were being published as the plan was being developed. However, many of the good planning principles underpinning the Ecosystem Approach (principles 1, 2, 3, 7, 9, 11 and 12) informed the method. The Plan was firmly built on the views and aspirations of the community, identified through many road shows, public meetings and surveys; at each stage of the Plan the community was asked to affirm that Plan was reflecting their expectations. Arising from this, the Plan has addressed a range of ecosystem services – including landscape, flooding, water quality, biodiversity – and the benefits that arise, such as economic gain from tourism helping maintain local shops. Policies have been drafted to help protect these but it would be true to say that the Plan was not prepared through a systematic analysis of ecosystems services. The ecosystems approach would be a useful framework through which to undertake the required review [in 3-5 years' time]; it may be helpful at that point to understand the economic benefits from services given the pressure on local and neighbourhood plans to deliver economic growth.

What has happened?

The Plan preparation has involved all of the initial stages of the cycles. IDEAS - through road shows, public meetings and on-line commentary the Steering Group generated a rich flow of ideas and aspirations for the structure of the Plan. SURVEY – an all-household residents' survey elicited over 700 responses and all businesses in the parish were asked to complete a questionnaire; discussions with school students elicited some further structured feedback. A raft of other evidence was gathered to help further understanding of the community and its context. ASSESS – in drafting the objectives and policies the Steering Group assessed a wide range of possible objectives and alternatives for site allocations; this was done through sounding boards of volunteers, environmental assessment criteria and conformity with strategic policies. The PLAN has been drafted and tested through further informal and formal consultation periods and is now undergoing formal, regulatory assessment by an independent examiner. It has already been used as a context for some development management decisions and the Town Council is committed to reviewing delivery and success in due course.

What is the added value of the Ecosystem Approach?

- See above.

- A simple ecosystem mapping exercise could be a powerful visual tool to aid discussion of environmental priorities and in particular to locate areas of deficit requiring more targeted interventions.
- Applying the Ecosystem Approach to the neighbourhood plan would be especially beneficial if it was also applied in the policy preparation of the Core Strategy; a common understanding at the strategic scale and local level of these services and benefits would be mutually reinforcing. To some extent extant SEA/EIA processes allow this but at a more superficial level.
- It provides a way of seeing where some ecosystem services are missing in the plan objectives.

What are the key barriers to progress?

The key issue would be the ability of the community to understand and apply the Ecosystems Approach in an oven-ready format. Feedback from the June workshop quickly found that the technical and academic language was off-putting to many involved at the community level of planning.

There are political limitations in the extent to which local knowledge(s) and plans are able to inform wider processes and decisions upstream which are generally delivered top-down to communities. The requirement for conformity remains one directional but in due course neighbourhood plans could be seen as essential building blocks for the strategic planning layer.

What are the lessons learnt?

- That good planning automatically embeds many of the principles of the ecosystem approach; therefore there are inherent dangers of portraying the approach as something new. There are opportunity spaces to improve existing plans and the idea of retrofitting the ecosystem services lens for monitoring and evaluation processes is attractive.
- That locally led-initiatives are very resource intensive requiring considerable inputs of time across the community
- The need to involve and sustain involvement of all key target groups in the plan process; for example the needs of local youth were particularly challenging to identify. This was partly as a result of having no youths on steering group, the 'bureaucratic' process of creating a plan and running it through the formal statutory requirements not being essentially attractive features.
- The need to present actions justified from evidence and surveys on the identified needs of the community in a clear and transparent way.
- A culture change is required in the way that local planning authority and the development sectors perceive communities and their planning role if this is to be effective more widely.

What next?

The most powerful step would be to undertake a robust analysis of local ecosystem services, their significant links to wider sets of services (sub-regional and perhaps global) and a clear catalogue of critical natural capital. On this basis the value of the services and capital could be established and used to drive both planning policy and implementation (e.g. through better management of places, payment for ecosystem services).

Another future option is to consider how the Ecosystem Approach might be retrofitted as a lens to inform the review and evaluation stages of the Plan and the additional value this might provide.

10.7.6.3 North Devon & Torrington Joint Local Plan⁴⁷

⁴⁷ <http://www.eatme-tree.org.uk/devon.html>

What is this case study about?

This case study illustrated how the development of the North Devon and Torridge Joint local plan can incorporate an Ecosystem Approach and embed an Ecosystem Services Framework to help shape the statutory framework for the future development of the area.

Where is this contextual setting?

The Joint North Devon and Torridge Local Plan is presently being prepared under the provisions of the Planning and Compulsory Purchase Act 2004 by North Devon Council and Torridge District Council. This forms the statutory plan for decision-making, involving a wide range of audiences and communities in its creation. Publication of the National Planning Policy Framework (NPPF) in March 2012 recognised the value of ecosystem services to the delivery of sustainable development as central to the Government's growth agenda. The local plan preparation process also drew together a number of other work streams which also centred on a recognition of the value of ecosystems services to plan making and decision-taking; these included participation as a pilot authority in a county wide biodiversity offsetting programme, involvement in the Ecosystems Knowledge Network and contribution towards other spatial strategies such as the UNESCO Biosphere Reserve at Braunton Burrows and the Nature Improvement Area on the culm measures.

What is the approach taken?

The approach taken was driven by Section 39 of the Planning and Compulsory Purchase Act 2004 which states that a local authority exercising their plan-making functions must do so with the objective of contributing to the achievement of sustainable development. The NPPF sets out a presumption in favour of sustainable development (paragraph 14) and advises that the planning system should contribute to and enhance the natural and local environment by a number of measures that include 'recognising the wider benefits of ecosystems services' (paragraph 109). The authority responded by mapping the different ecosystem services across its area as a baseline assessment. The local plan process necessarily embeds many of the principles of the Ecosystem Approach in its consideration of policy options and sites. For example Principle 1 reflects the acquisition and requirement for legitimacy through tests of soundness that include a preferred option in response to community engagement and its adoption through democratic processes. Principle 3 is relevant through the duty to co-operate across boundaries in plan-making thereby recognising impacts beyond plan boundaries and necessitating partnership approaches and policy prescriptions. Principle 5 will be central to the policy wording and accompanying justification and also in terms of process through the evaluation of alternative policy approaches at consultation stages of the Development Plan and its explicit recognition in the Sustainability Appraisal process.

E.g. "Policy ST11: Enhancing Environmental Assets: The quality of northern Devon's natural environment will be protected and enhanced by: ... (g) conserving and enhancing the robustness of northern Devon's ecosystems and the range of ecosystem services they provide;" (North Devon and Torridge local Plan, 2013, p.54)

The Ecosystem Services Framework was also embedded within a baseline assessment in the proposed masterplan for Westacott, a major housing development near Barnstaple and into the master planning of the Ilfracombe southern area extension. Here a simple ecosystem assessment was used to assess ecosystem services against key criteria.

Added value of the Ecosystem Approach

- It helped planners and elected members think of the environment and the natural processes operating within it as an asset for development rather than as a traditional constraint.

- It identified new environmental opportunities as part of the spatial vision theme for a world class environment in the local plan.
- The baseline assessment incorporating an Ecosystem Services Framework identified environmental opportunities and ecosystem service trade-offs that hitherto may not have been realised.
- The Joint Local Plan manages land use impacts of other infrastructure and service delivery partners; e.g. education, highway, health spending bodies as well as organisations developing other strategies that will have a land use impact on the locality (Biosphere Reserve); these include Natural England, the Environment Agency, the Forestry Commission, the National Trust and private landowners.
- Considering impacts and opportunities at a landscape scale ‘across the map’

Barriers to progress

- Business interests via the Local Enterprise Partnership still view the environment as a traditional restriction on development.
- Some elected members are reluctant to embrace the Ecosystem Approach as it imposes a new and complex vocabulary and takes people outside their traditional comfort zones.
- There are major concerns that Planning Inspectors may not ‘get’ ecosystem services and may find a plan unsound. This is a key perceptual barrier to overcome.
- Raising awareness of the value of the Ecosystem Approach to audiences.

Lessons learnt

- Pro-active (imaginative) and inclusive engagement with delivery partners using the same language early enough in the plan preparation so as to make a difference and demonstrate added value.
- Need for consistency across different strategies drawn up by different organisations – as far as is realistic – so these at least point in the same direction.
- Acquiring the necessary evidence from authoritative and up to date sources to underpin any policy prescription together with the need to secure councillor support (perhaps even a project champion) to ensure ecosystem service delivery is not compromised by the challenges posed by a less open and perhaps more traditional perspective on the Government’s growth agenda.
- The need to look beyond traditional plan boundaries in order to recognise the complexity and multi-layered character of ecosystems services (including a cultural dimension) and to market the environment as an asset with benefits to a wide range of potential users.
- Close working with external national organisations on developing the Ecosystem Approach added legitimacy to what might otherwise have been viewed as too parochial a focus; this was enhanced by active participation in the TABLES project and Ecosystems Knowledge Network.

What next?

The consultation draft responses are currently being worked through with a view to submit a revised plan in the winter. The masterplanning of Westacott, Barnstaple and the Ilfracombe southern area extension are presently being progressed using an ecosystem services assessment working with other organisations that include Natural England, the Environment Agency, English Heritage and North Devon AONB Partnership.

10.7.6.4 Cotswolds Area of Outstanding Natural Beauty⁴⁸

What is this case study about?

This case study is about how the Ecosystem Approach and its analysis might emerge as a driver in managing the Cotswolds' landscapes.

What is its contextual setting?

The Cotswolds Area of Outstanding Natural Beauty (AONB) is designated for its high quality landscape. A statutory Conservation Board across seven local authorities is charged to help ensure that the natural assets are conserved, enhanced, better understood and enjoyed. This has to be done in a way that also fosters the economic and social well-being of local communities. The main tool for this is the Board's Management Plan, updated every five years, which all relevant public agencies are bound by law to take into account in their operations. The Plan is also a crucial communication tool helping to inform land managers and others. In promoting conservation and sustainable development, the Board's approach needs to reflect the integrated management of land, water and living resources – in other words an Ecosystems Approach. A recent challenge for Board Members and officers was to reflect the Ecosystem Approach in updating their Plan.

How has the Ecosystem Approach been used?

The Ecosystem Approach did not feature in the initial development of the Plan. At that point, in 2010, the main concern was to overcome criticisms of the previous Plan; that it was both too complex and too generic, and that it had not engaged partners, public bodies or parish councils sufficiently to positively influence their decisions. But then a Board workshop in summer 2011, following publication of the Natural Environment White Paper, led officers to replace the traditional 'exploitative' view of natural resources within a systems approach. The subsequent Strategic Environmental Assessment did not, however, represent the integrated analysis that an Ecosystems Services Framework demands; thus ecosystems services was presented as an add-on benefit to society *alongside* scenic beauty, cultural heritage, economic development and green infrastructure – a point which the public consultation responses, including from Defra and its agencies, did not pick up on. At the final stages of plan preparation, however, pressure from the Secretary of State appointed members (informed by the lead taken in the latest Exmoor Park Plan) persuaded the Board that some retrofitting of the draft plan was needed to emphasise the more holistic approach that ecosystems science demands.

What has happened?

Ecosystems services are still presented in the final Cotswolds AONB Management Plan for 2013-18 as one of five multiple benefits for society delivered by good management and conservation of the outstanding landscape. But the introduction now provides a straightforward explanation of ecosystems services – divided into the four main categories. And the following double page spread (pages 10-11 of the Plan) illustrates the main services delivered from the AONB area, and how these will be sustained or enhanced by the individual plan objectives.

What is the added value of using the Ecosystem Approach?

- Retrofitting an Ecosystems Approach in this way may lead to operational changes as part of on-going review procedures.

⁴⁸ <http://www.eatme-tree.org.uk/cotswolds.html>

- Using the Ecosystem Approach signals the joined-up nature and interdependencies of management actions.
- Ecosystem services are linked to specific management plan actions; thus will be used and assessed in the implementation stage.

What are the key barriers to progress/mainstreaming?

- Language of ‘ecosystem services’ does not engage; seen as a specialist approach.
- People find it hard to adjust to the mindset of ecosystems thinking.
- Ecosystems services can look like yet another environmental overlay supplementing biodiversity, environmental assessment, climate change adaptation and mitigation and the like. The Ecosystems Approach ought to simplify the policy landscape by bringing such themes together and inform overall priorities. It needs to be used and accepted by all but is not.
- Strategic Environmental Assessment and Environmental Impact Assessment processes do not help because they have become a bureaucratic routine. They are used more to justify policies and actions already in the minds of decision makers, rather than to guide those people towards the best course of action.
- Ecosystems services theory is not complemented by economically efficient delivery instruments. Rewards under the Common Agriculture Policy, for example, compensate farmers for lost income, rather than rewarding the value of the non-food public goods they deliver.
- The interpretation of National Planning Policy Guidance by the Secretary of State, Inspectors and local government does not easily coexist with the strategic analysis of ecosystems – which makes it harder to encourage an ecosystems services framework to the use of land as a national resource.

What are the lessons learnt?

- Even a retrofitting approach can improve understanding about the priorities for action – which in turn (in this AONB) drive a separate business plan guiding the day-to-day work of the Board.
- In looking at the ecosystems services delivered, it is crucial to identify the beneficiaries and to estimate the relative values of services provided, in order to prioritise where there are conflicts or where resources are limited.
- Going beyond traditional administrative boundaries takes members outside comfort zones with genuine landscape-scale approaches.

What next?

- Having introduced ecosystems thinking, the Board now needs to flesh out the map and create a clearer picture of the suppliers and consumers of ecosystems services; these supply chains should then be subjected to SWOT analysis, in order to help inform the Board in prioritising activities at a time when resources are increasingly under pressure.
- Putting the Plan in place is not enough; its effectiveness in practice will depend on action by the Board to explain and persuade its public and private sector partners how an Ecosystems Approach will lead to better outcomes.
- The next plan needs to be structured more clearly around ecosystems and cultural service drivers, and needs to communicate the concept simply and persuasively.

10.7.6.5 Exmoor – Developing a place-based Payment for Ecosystem Service scheme for South West Peatlands⁴⁹

⁴⁹ <http://www.eatme-tree.org.uk/exmoor.html>

What is this case study about?

This study is about the development and design of a Payments for Ecosystem Services (PES) scheme for peatland rewetting on Exmoor National Park to achieve water management, carbon and biodiversity benefits, building on work undertaken by the Mires on the Moors Project and South West Water's (SWW) Upstream Thinking programme. Initially, work was jointly-funded by a SWW-NERC (Natural Environment Research Council) internship through the Environmental Sustainability Knowledge Transfer Network, with continuing work now funded by SWW and other interested parties in the South West.

What is its contextual setting?

Work has initially focussed on a target area of 2,000 ha in Exmoor. This forms part of the catchment of the River Barle, a tributary of the Exe. Water is extracted from the Exe for Tiverton and Exeter, and the Environment Agency licence requires that SWW must top up the river's flow in order to continue extraction when river levels threaten to fall below a stipulated level. Water is released from Wimbleball Reservoir for this purpose, and in drier years this reservoir can only be replenished by costly pumping from Exe Bridge pumping station where three diesel-powered pumps have the capacity to pump a total of 150 megalitres of water per day over a distance of five miles and a rise of 120 metres.

Peatland restoration on Exmoor has the potential to hold back water in times of peak rainfall, evening out the summer flow of the Exe, requiring fewer releases of water from Wimbleball reservoir and therefore less replenishment pumping in the winter. This all offers potential cost savings to SWW with which to pay for peatland restoration on privately owned farmland.

Restoration work to date has been undertaken as part of HLS (Higher Level Stewardship) land management agreement options, using the peatland rewetting supplement of £10 per hectare. SWW and local land managers are interested in how a longer term solution than HLS can be developed, given considerable interest in the carbon benefits of peatland restoration, as well as the benefits to local biodiversity within the Exmoor National Park. Local interest has therefore come from farmers and land managers, the Exmoor Society and the National Park Authority.

How has the Ecosystem Approach been used?

The particular focus has been on PES within the Ecosystem Approach as a whole (Principle 4). The leading farmers of the area and others with a key interest in the project are familiar with the language of ecosystem services, and wide interest has been shown in this practical project by local interest groups and the rural professional community. The work has taken place in close consultation with local stakeholders throughout the development of the PES scheme, where possible drawing on local knowledge in addition to scientific evidence, and balancing local interests with wider public interest (Principles 1 and 2).

What has happened?

Meetings have been held with local farmers and their representatives, as well as local groups of surveyors, valuers, agricultural lawyers and other rural professional advisers. This has allowed us to explore the practical concerns and aspirations locally regarding the development of PES. As a result of this we are developing a 'prospectus' for the terms on which SWW may be able to 'purchase' ecosystem services from local providers. This embodies advice to prospective vendors on how they may be able to appraise the financial and non-financial implications, positive and negative, for their businesses and land-holdings.

What is the added value of using the Ecosystem Approach?

- PES in particular has allowed us to frame the development of this scheme economically and practically. Public funding for peatland restoration is currently very limited, because it can only pay for the costs of restoration and any income foregone as a result of restoring the land, due to World Trade Organisation rules. Creating a market for the climate change mitigation, water and biodiversity benefits of peatland restoration can facilitate flows of private investment, which may incentivise wider uptake of restoration actions among the land management community in ways that are aligned with biodiversity conservation and sustainable land use.
- Although not yet realised in practical terms, it has also allowed us to consider the practical issues around the development of PES from a supplier/vendor perspective – in some respects balancing the emphasis in the academic literature to date on purchasers/users and theoretical perspectives.

What are the key barriers to progress/mainstreaming?

- Assembling the necessary financial data on water management costs in order to arrive at a sound financial basis for PES.
- Farmer and land manager concerns at the long term implications of rewetting for other land management activities – grazing livestock in particular.
- Legal concerns over the nature and duration of agreements, as well as an unsatisfactory legal framework under English law for the creation of such agreements (this allowed us to feed comments based on our experience into the Law Commission’s review of conservation covenants).
- Lack of comprehensive data on water management benefits and peatland carbon sequestration pending the outcome of long-term monitoring work being undertaken on Exmoor.

What are the lessons learnt?

Work is now moving into the final stages on the economic assessment for Exmoor. Attention is now turned to Dartmoor where different issues present themselves. The concern for water from Dartmoor is more about quality than quantity and flow management, and the land tenure considerations on Dartmoor include common grazing rights.

What next?

- There are genuine concerns amongst land managers and landowners over the long-term impact on their business of taking part in a PES scheme.
- The Ecosystem Approach has helped consider the development of policies for land management in a broader perspective using Exmoor as an example. The lessons from this are potentially relevant to the management of all rural land, but in particular in considering the future economy of hill and upland areas.
- The case study helped affirm the importance of PES needing to benefit all stakeholders, in particular in this case land managers and farmers, but also SWW as a company, the water users of the south west and shareholders in SWW.
- Further work is still being undertaken on the underlying economics of this scheme, but this looks as if it will provide valuable lessons in the practical development of PES programmes from a financial perspective and the adoption of ‘costing/pricing’ approaches rather than the ‘valuation’ approaches which have been more widely discussed in dealing with ESS and PES to date.

10.7.6.6 The Greater Birmingham and Solihull Local Enterprise Partnership: Spatial Plan for Recovery and Growth⁵⁰

What is this case study about?

This study is about the development of the spatial plan for the Greater Birmingham and Solihull Local Enterprise Partnership (GBSLEP). In late 2011 the GBSLEP Board first approved, in principle, the preparation of a strategic spatial framework plan covering the LEP area. The process has been delegated to a spatial planning group which is a voluntary partnership of public-private planners across the LEP with wider academic and environment group representation. The preparation of the Plan has been through the identification of ideas, extensive survey work and scenarios to produce a draft framework currently being subject to consultation until December 2013.

What is its contextual setting?

From the outset this Plan was seen to be unique from elsewhere in the UK; specifically:

- It would be informal, prepared through voluntary collaborative working amongst the LEP local planning authorities assisted by private, environmental and academic partners.
- It would be strategic providing a helpful context for existing and emerging local plans and helping inform subsequent reviews.
- The collaborative work on the Plan would help all local planning authorities satisfy the statutory Duty to Co-operate requirements (Localism Act, 2011).
- The plan should take a long term perspective, looking ahead at least 20 years and consider the broad scale and distribution of growth.
- It would provide a focus for relationships with adjoining LEPs crossing scales and sectors across the West and East Midlands and beyond.
- The plan process recognises that not all matters neither can nor need to be resolved at the same time. This ensures a flexible but robust approach.

How has the Ecosystem Approach been used?

The Ecosystem Approach has been used implicitly due to the lack of knowledge and familiarity with ecosystem thinking. An approach has been developed fusing spatial planning ideas with the Ecosystem Approach using the hook of the Duty to Co-operate. This necessitated crossing traditional public-private-business-academic-environmental boundaries. The development of a collaborative partnership model has allowed strategic consideration of housing need, climate change, flooding and employment across the GBSLEP as a whole. In so doing this augments the current GBSLEP economic strategy set within a virtuous triangle of Community, Economy and Environment. The draft spatial framework includes a set of operational principles (endorsed by the LEP board) that correspond with the 12 principles of the Ecosystem Approach to advise behaviour and policy.

What has happened?

- An initial visioning event was held in Solihull (February 2013) where initial mapping exercise of development plan policy across the GBSLEP was presented and discussed.
- Engagement events were held around a further series of themed events across the LEP (held in Bromsgrove, East Staffordshire, Solihull and Birmingham in September 2012).
- The identification and development of five Theme Groups and Leads to progress the framework: Shaping the Economy; Homes & Communities; Connectivity; Sustainable Living & Environment; and Urban Structure.
- A scenario testing phase using the five Theme Groups (December 2012 to January 2013). The identification and conceptual mapping of drivers of change.

⁵⁰ <http://www.eatme-tree.org.uk/birmingham1.html>

- A synthesis of the work so far at a brainstorming workshop of Theme Group Leads and other senior representatives drawn from across the GBSLEP to initiate strategy development and the identification of initial strategic objectives and strategic policies.
- The expression of the outputs in a presentation and series of related exercises to the Planning Summit held in Birmingham in April 2013.
- A draft [consultation strategy](#) published October 2013.
- A series of consultation events including the adaption of Rufopoly to a game of growth to maximise stakeholder engagement. [Background papers](#) including presentations to the events and notes taken are all available online.

What is the added value of using the Ecosystem Approach?

- A set of principles have been established to advise the planning process that embed the lens of the Ecosystem Approach.
- New opportunity spaces have been created including a pioneering biodiversity offset scheme; green infrastructure planning to link key centres across the LEP for recreational benefits.
- The lexicon of benefits and opportunities has helped to frame aspects of Duty to Co-operate within a wider understanding of linkages and dependencies; e.g. flood mitigation by investing in upstream farmers.
- The consideration of ecosystem services has led to the increased profile for agriculture, soil and biodiversity in the framework; here recognition has been given to the value of the Nature Improvement Area (NIA).

What are the key barriers to progress/mainstreaming?

- The perception that the framework is nothing more than a cumulative distillation of all planning policy across the LEP with limited added value.
- The lack of community group and third sector representation thus far has led to some critical comments about the ownership of the framework.

What are the lessons learnt?

- There are advantages in not using the language of ecosystem services explicitly when working with spatial planners.
- Working with existing mechanisms as hooks such as the Duty to Co-operate is a better guarantor of success than using something new and outside day-to-day working.
- The importance of the Spatial plan as an evolving process rather than being a plan to a fixed timetable has enabled a much more fluid and flexible process maximising learning and feedback amongst participants.
- The power of a voluntary grouping of people within a meaningful and innovative public private partnership of spatial planners who have a real stake in the process and the outcomes.

What next?

The consultation process will take place from September to December 2013 with the final strategy submitted to the GBSLEP board for approval in spring 2014.

10.7.6.7 South Downs Nature Improvement Area (NIA)⁵¹

⁵¹ <http://www.eatme-tree.org.uk/downs.html>

What is this case study about?

This case study is about assessing and demonstrating the benefits of ecosystem services to society. The Nature Improvement Area (NIA) overall provides mechanisms and pilot projects to value the ecosystem services and resources generated by the chalk landscape. This case study focuses on 'The Town to Down' objective of the South Downs NIA which aims to assess and demonstrate the benefits of ecosystem services to urban populations; particularly drawing on the '*Chalking up the Benefits*' project led by the Lewes & Ouse Valley economics Group (L&OVe). This project works with the local community to explore and record the benefits that the local environment affords the people of Lewes in terms of human and economic wellbeing.

What is its contextual setting?

The South Downs Way and the chalk scarp lie less than five kilometres from town centres on the coastal strip. The coastal plain to the south of the Downs is one of the most densely populated coastal areas in Northern Europe and the downland landscape has strongly influenced the character of many of these settlements. The South Downs chalk is a managed landscape which provides enormous benefits to a wide range of people (over 46 million day visits recorded in 2012⁵²). Chalk grassland is the defining landscape and habitat of the Downs and constitutes an estimated 4% of the area of the South Downs National Park.

The NIA project provides habitat enhancement, restoration and reconnection to develop a bigger, better, more joined up ecological network across the NIA with attention to the flora, fauna, soils, geology and hydrology of the chalk. The work programme builds on existing recreation, education and volunteering initiatives to deliver involvement, education and cultural services across the NIA. The NIA also aims to connect local communities, businesses and other key stakeholders with the chalk landscapes of the Downs. This includes a comprehensive stakeholder engagement programme to enable better understanding of the relevance and value of the vital ecosystem services provided by the chalk in order to conserve and manage this iconic landscape.

How has the Ecosystem Approach been used?

The NIA provides engagement opportunities to enhance the understanding of the value, benefits and importance of conserving and restoring chalk habitats. It includes mechanisms and pilot projects to value the ecosystem services and resources generated by the chalk. For example, the '*Chalking up the Benefits*' project works with the community to explore, document and map local stakeholder perceptions of the benefits to wellbeing in Lewes from the local environment (with a focus on the chalk downs) and to raise and spread awareness of the current and potential gains for the local economy from locally provided ecosystem services.

What has happened?

A range of Ecosystem Approach based mechanisms and (pilot) projects are being delivered under the 'South Downs Way Ahead' NIA 'Town to Down' objective which aims to assess and demonstrate the benefits of ecosystem services to urban populations. To provide a specific example, the '*Chalking up the Benefits*' project is documenting which local landscapes and habitats provide ecosystem services and to what degree, within a 5 km square around Lewes to gain an understanding of the area's ecosystem services and has looked to the National Character Areas (NCAs) profile to help decide how they can set about improving the value of some, especially key ecosystem services, via Strategic Environmental Opportunities (see below). This information will be supplemented by

⁵² Source: <http://www.southdowns.gov.uk/about-us/news/tourists-bring-464-million-boost-to-south-downs-economy>

detailed ecosystem service mapping carried out by Sussex Wildlife Trust and the South Downs National Park using the EcoServe product.

What is the added value of using the Ecosystem Approach?

The process has encouraged communities and business providers alike to begin to recognise the wealth of benefits that they receive from the environment which can often be overlooked. Through linking the project to the National Character Areas (NCA) framework⁵³, it could give the project wider credibility and there are opportunities to explicitly demonstrate how ecosystem services at a national level can be transferred into local community action; i.e. the relevant 'opportunities' section within South Downs National Park NCA could be directly linked to actions within the Valuing Ecosystem Services for Lewes (VESL) process for identifying future ecosystem services projects in Lewes.

What are the key barriers to progress/mainstreaming?

Key barriers to progress relate to time, human and financial resources.

- L&Ove being a community group has meant that human resources and time are limited and at times unreliable with negative consequences for this ambitious project. L&Ove's engagement with planning and organising public events has been extremely good, but more strategic engagement by the group with professionals and publics has relied heavily on those within the group with suitable professional skills and experience. This raises a tricky issue of voluntary versus professional engagement – something with which the Group is still grappling.
- Time availability for key stakeholders affects progress and mainstreaming – particularly for potential business stakeholders, in what have been tough economic times. To date, it has proved easier and faster to engage with community and public service bodies than with business-oriented bodies (particularly SMEs which have been the Group's focus). However, public service bodies are also 'spread thin' and time is a real issue for educators, health professionals, planners, etc.
- Financial resources have severely limited the potential input from the one paid Project Officer for *Chalking up the Benefits* (resulting in the officer contributing a considerable amount of voluntary time which is unsustainable and limits projects activities/outcomes).

What are the lessons learnt?

- The need to acknowledge that a wide range of stakeholders within the community is not necessarily familiar with the ecosystem services terminology, requiring considerable simplification and 'translation'.
- Finding appropriately targeted messages to help engage different stakeholder groups is important.
- Partnership working has been invaluable in achieving what has been undertaken by the *Chalking up the Benefits* project to date.
- The 'Naturegain Going Local' workshop process has proved effective and useful in raising awareness amidst those already linked professionally (or as NGOs) with the environmental, conservation and/or sustainability agenda. Trialling with lay audiences has, to date, been limited but effective when linked to a key issue.
- Tools to raise awareness of the Ecosystem Approach and ecosystem service agenda is a means to an end – a community group is a valuable way of ensuring the tools are appropriate for that community, but professional and skilled input is also proving vital.
- It is questionable whether L&Ove's rather strategic mission is appropriate for a community group in all settings at the current stage of public awareness of ecosystem services and the

⁵³ <http://www.naturalengland.org.uk/publications/nca/default.aspx>

ecosystem approach. The group is still struggling with this issue in terms of bringing additional new people from a wide range of backgrounds into L&Ove to help carry out its ambitious programme.

What next?

- As the 'Chalking up the Benefits' project progresses, L&Ove is aiming to show how the value of some local goods are measured and how these goods relate to specific local ecosystem services and the management processes needed to allow those services to flow from the local landscape.
- Work on 'Valuing Ecosystem Services for Lewes (VESL) is underway, identifying the services from different habitats/areas and drawing up criteria for their valuation. The aim is to undertake detailed case study of at least one habitat for valuation and at least one enterprise to investigate their valuation of the benefits they receive. Work on a case study of the Lewes Railway Land Nature Reserve is underway. L&Ove is planning to work with businesses within the Lewes community and, amongst other things, to introduce them to the 'invisible economy'⁵⁴. The aim is to develop a local integrated land management project to bring ecosystem service producers and beneficiaries together to seek win-win-win solutions for the environment, human community and economy.
- Brighton and Hove City Council and a host of local partners, including Natural England, are submitting a bid to UNESCO in September 2013, proposing that the Brighton & Hove and Lewes Downs **become a UNESCO Biosphere Reserve**, as an **international best-practice area**, bringing people and nature closer together and aspiring to be 'world class by nature'.
- Proposals under the Biosphere bid have a strong link to the landscape's ecosystem services and the South Downs NCA Profile has served as a foundation for discussion with partners, helping them to evaluate the role of each ecosystem service within the proposed biosphere reserve. The resulting bid makes a strong reference to how the South Downs NCA's Strategic Environmental Opportunities (SEOs) are likely to benefit the value of ecosystem services within the proposed biosphere. If the bid is successful, it is intended that the profile's SEO's will be at the core of implementation work within the Biosphere Reserve.
- Ecosystem service mapping in Sussex is starting in the NIA and the L&Ove Project area and lessons learnt in this work will inform ecosystem services mapping through the rest of Sussex.

10.7.6.8 Staffordshire Ecosystem Assessment⁵⁵

What is this case study about?

This case study is about using the Ecosystem Approach within an ecosystem assessment of the Staffordshire's ecosystem services to inform a range of plans and strategies currently being developed across the county and its immediate neighbours; specifically Stoke-on-Trent and Staffordshire Local Enterprise Partnership (LEP) strategic plan, Health and Wellbeing Boards' strategies, and other strategic planning. The objective is to ensure that sectors, organisations and departments which are usually not involved in environmental management and conservation recognise the true value of ecosystem services and how they relate to their activities.

What is its contextual setting?

The Staffordshire Local Nature Partnership (LNP) has the vision to make Staffordshire a more prosperous and healthy environment to live in and believes that economic development can and

⁵⁴ Sukhdev, P. (2010) *The invisible economy*. Bank of Natural Capital; Part of the TEEB Story. <http://bankofnaturalcapital.com/2010/10/04/dr-pavan-sukhdev-on-the-invisible-economy/>

⁵⁵ <http://www.eatme-tree.org.uk/staffordshire.html>

must go hand-in-hand with the protection of the County's important environmental assets. A priority objective identified by the LNP was to enable effective working partnerships between the environmental, economic, health and social sectors to improve decision-making and make the most of the green environment.

How has the Ecosystem Approach been used?

Staffordshire County Council and its partners have shifted towards ecosystem services thinking and are applying the ecosystem services framework in response to recent central government initiatives. Another reason is that the ecosystem services framework supports the objective of environmental protection and management and justifies resource allocation in the context of budgetary constraints.

On behalf of the LNP, Staffordshire County Council, in partnership with Stoke-on-Trent City Council and Staffordshire Wildlife Trust, has commissioned an Ecosystem Assessment for the geographical area of Staffordshire and Stoke-on-Trent. The main aims were to provide an evidence base and to encourage discussions and partnerships between organisations and departments; especially between those specialising in environmental advice and management and those with significant impacts and/or dependencies on ecosystem services.

What has happened?

This Staffordshire Ecosystem Assessment incorporated the latest evidence and best practice from science and existing studies with a focus on assessing the links and interdependencies between local activities and service providers and ecosystems as well as the (monetary) value of ecosystem services 'produced' in Staffordshire. Monetary values have been estimated for ecosystem services for a set of broad habitat types. At the moment of writing, the assessment was still in progress. Altogether, 956 km² of habitats have been assessed which constitutes just over 35% of the total geographical area of Staffordshire. Stating the best guess, the ecosystem services assessed have been valued at more than £110 million annually. If aggregated over 200 years, the value of ecosystem services performed in Staffordshire adds up to more than £7 billion (Hölzinger & Everard, in progress).

What is the added value of using the Ecosystem Approach?

The process encouraged involved parties to think 'outside the box' and to leave their comfort zone when discussing environmental issues. It also encouraged new potential partnerships and revealed some potential trade-offs when managing ecosystem services (such as between food production through intensive agriculture and water quality/biodiversity) as well as support for relevant follow-on projects (such as payments for ecosystem services). Overall, participating parties were confident that the Ecosystem Assessment for Staffordshire provides relevant evidence in a format that allows enhanced communication of the importance of nature to sectors, services and functions which are usually not involved (and sometimes interested) in environmental issues.

What are the key barriers to progress/mainstreaming?

The main barriers to the process of the Ecosystem Assessment were limitations to the available scientific evidence base, but also to baseline data. A range of ecosystem services have been identified where a monetary valuation would be possible in principle, but where no primary valuation studies were available to apply the benefit transfer approach. Another limitation arose from the availability of statistics. In the case of provisioning services, relevant statistics were missing or only available at the national scale. Another issue was to address the trade-off between simple and tangible outcomes, on the one hand, and applying high scientific standards, acknowledging the complexity of valuing ecosystem services, on the other.

What are the lessons learnt?

- The need to involve all key stakeholders within a deliberative process to build sufficient trust and legitimacy in the process.
- The employment of specialists to undertake the assessment process helps overcome the complexity and also the outsider perspective is able to help overcome local politics.
- The need to acknowledge that many relevant stakeholders and consultees are not familiar with the ecosystem services terminology and thus requires considerable simplification and ‘translation’.
- The trade-off between acknowledging complexity and providing tangible outcomes for a non-specialised audience has been solved by tailoring a short executive summary written in plain English and supported by graphical representation of key findings, and a detailed report for a more specialised audience.

What next?

The assessment has identified the fact that ecosystems support the objectives and goals of sectors and organisations which may not work closely together as a matter of course. The report evidence will be used to encourage partnership working and incorporation of ecosystems thinking into economic and health and wellbeing policy development. The Staffordshire LNP proposes to utilise the assessment as an engagement tool with the Local Enterprise Partnership and health and wellbeing sector. The assessment will also be used to inform planning policy and assessment of major infrastructure and development projects, such as minerals proposals. Further work, in the form of an i-Tree assessment, is recommended to inform the management of street trees. Investigation of the potential for payments for ecosystem services projects in the County is a potential follow-on project.

10.7.6.9 Isle of Wight AONB Management Plan Review Process⁵⁶

What is this case study about?

The Isle of Wight (IOW) Area of Outstanding Natural Beauty (AONB) Unit are currently in the process of reviewing their statutory management plan (July 2013). The IOW AONB area covers approximately half of the island and comprises five distinct land parcels designated for their outstanding natural beauty and variety of high quality landscape types.

Natural England Ecosystems Services specialists, Natural Character Assessment Support Team and IOW local contacts are working closely together to support the AONB in evaluating the scope and content of the IOW AONB management plan review. The ambition is to identify the beneficiaries of the AONB’s ecosystem services, and consider how they can be included when evaluating the future management options and outcomes of the plan and inform the extant local development framework as it seeks compliance with the NPPF. It is recognised that the AONB has significant ecosystem services with the cultural ecosystem services being vital for the islands tourism industry.

This approach will inform the IOW AONB’s forthcoming management plan (operational from 2015-2019), which draws together all interested parties to outline the key policies, actions and objectives required to generate a long-term vision for the management of the AONB.

What is its contextual setting?

Defra, Natural England (NE), the Environment Agency and other statutory bodies are championing the use of an Ecosystem Approach. The AONB unit decided to use ecosystem services, drawing on

⁵⁶ <http://www.eatme-tree.org.uk/wight.html>

the Natural Character Area⁵⁷ profile work undertaken by Natural England as the foundation for their Strategic Environmental Assessment (SEA) Scoping Study to inform future management plan objectives and policies. The IOW NCA covers the whole island and is being authored concurrently alongside the management plan. Thus the AONB unit are looking to the emerging IOW NCA profile to provide a key mechanism for promoting an island-wide Ecosystem Approach. NE and Defra, via its work on catchment management planning, are also working with the AONB to refine the approach through statutory management plan review process.

How has the Ecosystem Approach been used?

The management of the IOW is increasingly being viewed through the lens of the Ecosystem Approach as it recognised that the benefits derived from ecosystem services are often overlooked from local decision-making. Drawing upon Ecosystem Approach information has informed the management plan review which is taking an Ecosystem Services Framework to demonstrate the wider societal role that the AONB plays within the island's economy and people that it benefits.

While an Ecosystem Approach has been used to inform the SEA Scoping Report, it does not comprise a comprehensive ecosystem assessment; more an inventory of ecosystem and non-ecosystem services apparent and an overview of their environmental considerations. The main themes of the SEA are: Biodiversity, Population, Human Health, Water, Soil, Air, Climatic conditions, Cultural Heritage and landscape. With this in mind the future Wight AONB Management Plan has been split into discrete yet overlapping categories, which will be assessed considering the environmental, social and economic benefits from the landscape. The overarching Ecosystem Approach will influence the objectives and priorities of the Management Plan and help identify any short comings in the evidence baseline.

What has happened?

Natural England have been working with IOW AONB to help to frame their thinking and ensure that they can produce a robust plan to meet the needs of the AONB and the island as a whole. In order to further assist the AONB with this work, NE, Defra and TABLES representatives undertook a workshop with IOW AONB and IOW Council. Day one allowed for discussion around the ecosystem services provided by the AONB within the AONB landscape. Day two was classroom based and focused on opportunities for mainstreaming the ecosystem approach through catchment-management planning, and developing the approach through understanding neighbourhood plans to inform future AONB work with communities. It also focused on local case studies and explored the opportunity for integrating spatial planning. Finally, a section of the workshop also focused on refining the draft AONB Strategic Environmental Assessment and highlighted early priorities around the island's most prominent ecosystem services which will inform Strategic Environmental Opportunities for the draft IOW NCA.

The AONB has incorporated various considerations outlined within the workshop within their draft plan and are currently undertaking a series of partnership workshops to introduce the draft plan and the ecosystems approach (October 2013). This will in turn refine their priority management plan indicators.

⁵⁷ Natural Character Areas profiles include a description of the key ecosystem services provided in each character area and how these benefit people, wildlife and the economy. They identify potential opportunities for positive environmental change and provide the best available information and evidence as a context for local decision making and action. See the tool review for more information.

<http://www.naturalengland.org.uk/publications/nca/default.aspx>

What is the added value of using the Ecosystem Approach?

Through adopting the ecosystems approach for reviewing the Isle of Wight AONB management plan, the AONB have identified that they are in a position to provide a more robust review of their current management plan. The AONB recognise that their current AONB management plan has previously not been 'fit for purpose'. Therefore focusing on the extensive range of ecosystem services that the IOW provides will allow the AONB to focus on their priorities and adopt a more evidence-based approach for identifying the best possible management indicators for the AONB as well as highlighting how integral the AONB is to the rest of the island in consideration of the wealth of ecosystem services that it provides. The IOW NCA being authored concurrently will allow for clear synergies and join up regarding the priority management opportunities for the island.

What are the key barriers to progress/mainstreaming?

There have been difficulties in determining how infrastructure such as transport and highway (which are fundamental elements within the AONB) can be reflected as ecosystem services within the plan⁵⁸.

It has also been difficult in some cases to 'sell' the concept of adopting an ecosystems approach and the benefits to various AONB partners, which has highlighted the need to keep the language used very straightforward and understandable.

What are the lessons learnt?

- Adopting an ecosystems approach has presented a range of challenges and has proved to be more time consuming in relation to reviewing the management plan.
- The need to acknowledge that many relevant stakeholders and consultees are not familiar with ecosystems terminology. There is a need to tailor the language used in relation to the relevant audience.
- The timeframe for reviewing the AONB management plan needs to be completed by April 2014. Therefore it is recognised that this forthcoming plan will only have the opportunity to outline the ecosystem services that the AONB provides to the island communities and visitors and link to some management plan objectives. However it is recognised that it will inform future AONB management plans and link more explicitly to objectives as well as informing other strategies such as the IOW local plan.

What next?

IOW AONB will soon be going out to public consultation regarding their plan and the workshop has identified a range of consultation tools for explaining the approach. The ecosystem sections of the IOW NCA as a whole will continue to inform the evolution of the IOW management plan review and it is the intention that the IOW AONB management plan and IOW NCA will be launched in tandem on the Isle of Wight to demonstrate highlighting the measures and environmental practices which have the capacity to improve the value of the Isle of Wight's ecosystem services as a whole. The documents will also link with the various IOW catchment plans and River Basin Management plans, securing further join up with Defra and the Environment Agency.

The statutory management plan will be adopted by the IOW council and as a result, the IOW AONB and IOW Council have had discussions around developing long term vision with main island partners for island wide eco services to inform future AONB management plans and future IOW local plan and it is envisaged that the broad island wide ecosystem services outlined within the forthcoming IOW NCA will inform this wider thinking.

⁵⁸ The suggested option to use all 12 principles of the ecosystem Approach has helped address this.

10.7.6.10 Strategic Environmental Assessment of the Scottish Rural Development Programme⁵⁹

What is this case study about?

The Scottish Rural Development Programme (SRDP) is a programme of economic, environmental and social measures, utilising hundreds of millions of pounds of European Agricultural Fund for Rural Development funding plus domestic Scottish Government funding. The programme is designed to support rural Scotland from 2014 – 2020. Individuals and groups may seek funding from the SRDP to help deliver the Government's strategic objectives in rural Scotland.⁶⁰

As part of the development of the SRDP a Strategic Environmental Assessment (SEA) is required. The overall aims of the SEA are to ensure that:

- Likely significant effects on the environment of implementing the RDP are identified, described, evaluated and taken into account before the plan is adopted; and that
- Reasonable alternatives, taking into account the objectives and geographical scope of the plan, are evaluated for their likely significant effects and inform the nature and content of the proposed RDP.

Collingwood Environmental Planning (CEP) with Agra CEAS were commissioned to undertake an evaluation of the emerging SRDP and the SEA. This case study considers the SEA.

What is its contextual setting?

The SRDP is a large, strategic level programme of numerous policies and funding streams to support rural priorities. It has significant scope for both positive and negative environmental effects. The SRDP is also subject to a number of comprehensive internal and external consultations, reviews and revisions. The SEA is intended to support the design and development of the SRDP to minimise any potentially negative environmental effects and to maximise potential positive effects. The scale of funding means that the SRDP is subject to a high level of interest and oversight.

How has the Ecosystem Approach been used?

The Scottish Government requested proposals to undertake the SEA, CEP suggested that it would be effective to include ecosystem services within the SEA assessment framework. This was partly based on the encouragement given by the Scottish Government to applying an Ecosystems Approach to land use planning. Therefore it was felt appropriate to develop a tailor-made methodology for the SEA of the SRDP that incorporates elements of ecosystem services into the assessment framework. Most of the other aspects of the Ecosystem Approach are inherent in the SEA and the SRDP and only the inclusion of ecosystem services is felt to differ from a traditional approach.

The nature of the schemes and policies supported by the SRDP suggested that an ecosystem services perspective could provide added value to understanding the impacts, dependencies and resilience of much of the rural economy on the ecosystem services provided by the environment. This sort of approach was felt to be consistent with the priorities for rural development. It was therefore proposed that an assessment framework for the SEA that included ecosystem services be developed in full consultation with key stakeholders, including the Scottish Environment Protection Agency, Scottish Natural Heritage and Historic Scotland. The proposal was accepted and the initial

⁵⁹ <http://www.eatme-tree.org.uk/scottish.html>

⁶⁰ More information is available on the Scottish Government's website: <http://www.scotland.gov.uk/Topics/farmingrural/SRDP/SRDP20142012>

consultation on the development of the framework and the inclusion of ecosystem services was done by holding a Scoping Meeting with key stakeholders. This involved a discussion of what were the: major environmental issues and priority ecosystem services, how could the SRDP potentially negative effect these and what were the opportunities to increase the provision of these ecosystem services.

What has happened?

On the back of the process above a Scoping Report⁶¹ was presented for further consultation, this document set out the approach and the major environmental issues including those relating to ecosystem services. Feedback received from a wide range of stakeholders was good and the inclusion of ecosystem services, priority environmental topics was agreed. As a result ecosystem services were included across the baseline section of the SEA, within the objectives that form the main assessment framework and within the consideration of cumulative effects.

What is the added value of using the Ecosystem Approach?

Ecosystem services were viewed as a more effective way of thinking about the Scottish environment and the likely effects of the SRDP. In effect the intention was to describe the benefits Scotland receives from its environment and to find opportunities for the SRDP to increase these benefits, consistent with the Scottish Government's commitment to the Ecosystems Approach and rural development.

Ecosystem services also crosses many of the topics that an SEA is required to consider, this more integrated approach was felt to be a good way of consider the cumulative effects of the SRDP policies and programmes.

What are the key barriers to progress/mainstreaming?

The number and scale of environmental effects that cascade from the SRDP provide a challenge in terms of understanding the total likely environmental effects, the changes to ecosystem service provision and relating this to the baseline. The response has been to focus on priority policies, ecosystem services and topics and to considering in less detail those effects that are less significant.

What are the lessons learnt?

- Stakeholders, specifically those who responded to the Scoping Report, appreciate, and even expect, the consideration of ecosystem services.
- The Scottish Government has made it clear that it supports the use of ecosystem services and this made the inclusion of the concept into the SEA easier and more effective.
- Causal chain analysis has been found to be an effective way of relating environmental effects from strategic programmes to impacts on ecosystem services. Although this must be supported by a consideration of the baseline conditions and inter-relationships.
- It is appropriate to focus on and assess priority ecosystem services, for example soil carbon sequestration, flood regulation and cultural ecosystem services, this avoids some of the over complications that are endemic to many ecosystem services based assessments.
- Ecosystem services has been integrated into the SEA methodology, it is neither a separate bolt-on nor the fundamental structure of the SEA. This has been effective and has shown that ecosystem services can be included within SEA without increasing the level of required resources or seeking high levels of data and quantification.

⁶¹ Scottish Government (2013) SEA SRDP Scoping Report:
<http://www.scotland.gov.uk/Topics/farmingrural/SRDP/SRDP20142012/SRDP20142020ExAnteEvaluationSEA/SRDPSRDP20142012SRDP20142020SEA>

What next?

The Environment Report setting out the likely environmental effects, possible mitigation options and potential for opportunities will be finalised and published for consultation. This will include consideration of reasonable alternatives.

After consultation the Scottish Government will decide the final SRDP options and seek to finalise the required policies supported by an understanding of the likely environment effects and provision of ecosystem services as set out in the SEA.

10.7.6.11 Natural Resources Wales: Mainstreaming the Ecosystem Approach⁶²

What is this case study about?

This is about the development of a framework for staff in Natural Resources Wales (NRW), a newly formed body that has taken over the functions previously carried out by the Countryside Council for Wales, Forestry Commission Wales and the devolved functions of Environment Agency Wales, to embed the ecosystem approach in all their work activities.

Where is this contextual setting?

NRW has a unique opportunity to take a more joined-up approach to managing and caring for the environment and its natural resources. As a new organization bringing together a range of functions within a sustainable development remit, the ecosystems approach will be central to its thinking. The NRW Ecosystem Approach Framework is aimed at all staff in NRW. Its purpose is to help staff understand what the ecosystem approach is about, and to start to apply it in everyday work. It is an introductory guide setting out:

- a set of core principles;
- an understanding of ecosystems and the services they provide;
- some key steps that can be applied to a range of activities from projects and programmes to plans and policies; and
- a range of resources available to assist in decision making.

The framework was initially based on a review of what other organisations are doing, in the UK and around the world, and has drawn out common features and best practice from these examples. As well as being a useful resource within NRW, the framework will help partnership working, and the information can be adapted to suit a range of other agency audiences.

How has the Ecosystem Approach been used?

The framework was further developed through consultation and workshops with members of the key Welsh agencies that now make up the new organisation. In addition, close co-operation was established with the TABLES project to share best practice in the co-development of their respective Ecosystem Approach frameworks. Here, there has been particular emphasis in the mapping of potential ecosystem-serviced tools from the TABLES project to the specific stages of the project or programme (**Figure 10.4**). The approach has been built around a policy/programme cycle and highlights key activities within each stage of the process in the form of questions and tasks that should be undertaken. It sets out seven ways in which the Ecosystem Approach should be applied:

- **integrated:** it should be integrated with existing decision-making;
- **timely:** it should be engaged early in the decision-making process;
- **participative:** the process should involve multiple stakeholders.

⁶² <http://www.eatme-tree.org.uk/wales.html>

- **visionary:** the use of the approach should be ambitious (but realistic);
- **iterative and adaptable:** the approach employed should be constantly reviewed and adapted;
- **outcome-driven:** providing environmental benefits above all and risk-based; the environment should be taken into account.

What is the added value of the Ecosystem Approach?

In setting up the new agency and bringing together a wide range of different environmental functions, the ecosystem approach is providing a fundamental basis to a new way of working, capable of pointing the way forwards to more sustainable use of our natural resources. In future it should help to:

- produce win-win situations;
- assess positive and negative impacts of options for NRW activities on ecosystems, their services and associated benefits;
- develop a shared vision and clear ecosystem based objectives for activities and monitoring them;
- support better decisions with a wider evidence base and ensure that lessons learned are captured to improve the way NRW and its partners manage natural resources;
- identify distributional impacts of activities in terms of who benefits and who loses from investments in ecosystem services.

What are the key barriers to progress?

- The creation of NRW marks a major change to the institutional landscape of Wales. As such there may be other priorities that take precedence in the short term.
- The creation of a new body from CCW, EAW and FCW involves a lot of institutional baggage and legacy issues that may conflict with the roll out of new working practices.
- In terms of implementation of the ecosystem approach, getting everyone to understand what this means for them and their work and just understanding the terminology is a challenge (language around ecosystems can be perceived as a barrier).

What are the lessons learnt?

- Being the innovator in mainstreaming or institutionalising the Ecosystem Approach means that it is always going to be a harder journey as you are venturing into the unknown.
- Political support within the institution and its partners to maximize traction is vital.
- The huge investment in time and resources to produce organizational working frameworks must be recognized.
- There is already good practice out there; important to reassure that framework is a fusion of good working practices; a lens within which to order work practices situations.

What Next?

This innovation is being led by a small core who understand and have been involved in the framework, but in terms of implementing it across NRW, the bigger majority has yet to be reached. The Ecosystem Approach needs to move from being perceived as a theoretical concept (albeit with some really good practical case examples) to being something that people can get to grips with in their day to day work. The pilot scheme is currently being tested and reviewed by the staff. NRW is the first agency to attempt to embed the Ecosystem Approach explicitly in its day to day working. There is ongoing collaboration with the TABLES projects with work currently proceeding on the mapping of the EATME tree to the NRW guidance. The focus on using ecosystem serviced tools will be key.

10.7.7 Summary

Drawing on the combined assessments of the tools and case studies assessments with respect to their adherence to the Ecosystem Approach (**Tables 10.11 and 10.13**), they reveal that the Ecosystem Approach is rarely applied in its totality within any PPPP. Overall principles 2 - subsidiarity, 6 - limits and thresholds and 8 - long termism are underrepresented; whereas principles 1 - societal choice, 4 - economic and social drivers, 5 -ecosystem resilience and 11 - evidence from multiple sources, are overrepresented. Thus it is dangerous to assume that all the principles of the Ecosystem Approach are implicit in current PPPPs and tools that use an Ecosystem Services Framework. Given that we have used case studies that are exemplars this should serve as a wakeup call to benchmark all these principles identifying indicators as part of a PPPP evaluation as recommended in our guidance. It is beyond the brief of our project to develop these indicators and indeed these should be developed in the context within which they are located. **Box 10.7** serves as a useful starting point for this process.

10.8. Mainstreaming the Ecosystem Approach in Theory, Policy and Practice

10.8.1 Approaches to mainstreaming the Ecosystem Approach

The diverse approaches to mainstreaming the Ecosystem Approach encountered within our case studies and tools used in this project reflect the ‘messy’ reality of application in practice, the ever-changing policy dynamic, and the vulnerability inherent within making the transition from narrow sectoral approaches towards more systemic practice. This is magnified, not only, by contemporary governance arrangements and significant resource and capacity limitations within agencies, but also within increasing demands for speedy decisions on complex resource management issues amidst great uncertainty. The danger here is that the lack of time and lack of institutional flexibility combine, leading to sub-optimal PPPPs and inappropriate use of tools.

There is also a disconnect between perceived priorities, with the Ecosystem Approach focussing on longer-term sustainable outcomes, which can create tensions with established short-term drivers for economic growth. In this section, we draw upon our case study narratives and suite of tools to identify and unpack the different approaches that we have encountered in the mainstreaming of ecosystem thinking within four different mainstreaming models (**Table 10.14**). These reflect different components of ecosystem mainstreaming as depicted in **Figure 10.19**. The models are mutually exclusive, though in practice they constitute separate destinations along a continuum. However, they should not be seen as part of any automatic or logical progression. The models reflect progress from the *status quo* of a narrow disciplinary and institutional focus towards increasing active internalisation of the ecosystem approach into PPPP processes. As part of the transition to this thinking, it should be stressed that our advice in the previous chapter provides a pragmatic translation and adaption of the 12 principles to a policy/decision making cycle; thus it should not be seen as some utopian state. In none of our case studies was there evidence of proponents paying ‘lip service’ to the ecosystem approach, though it is important to note that these case studies were selected as exemplars rather than as a representative sample of established practice.

Table 10.14. Overview of case studies’ models towards mainstreaming

| CASE STUDY : | EA PRINCIPLE: | Approach Taken to Mainstreaming |
|---------------------------------|---------------|---------------------------------|
| SCOTTISH RURAL DEV. PROG. – SEA | | Incremental |
| NORTH DEVON/TORRIDGE LOCAL PLAN | | Incremental |
| GBSLEP | | Retrofit |
| SOUTH DOWNS NIA | | Ecosystem Services-led |
| ISLE OF WIGHT AONB | | Incremental |
| COTSWOLDS AONB | | Retrofit |
| BIRMINGHAM CITY COUNCIL | | Ecosystem Services-led |
| STAFFORDSHIRE LNP | | Ecosystem Services-led |
| MUCH WENLOCK NEIGHBOURHOOD PLAN | | Retrofit |
| EXMOOR South West Water | | Ecosystem Services-led |
| NATURAL RESOURCES WALES | | Ecosystem Approach-led |

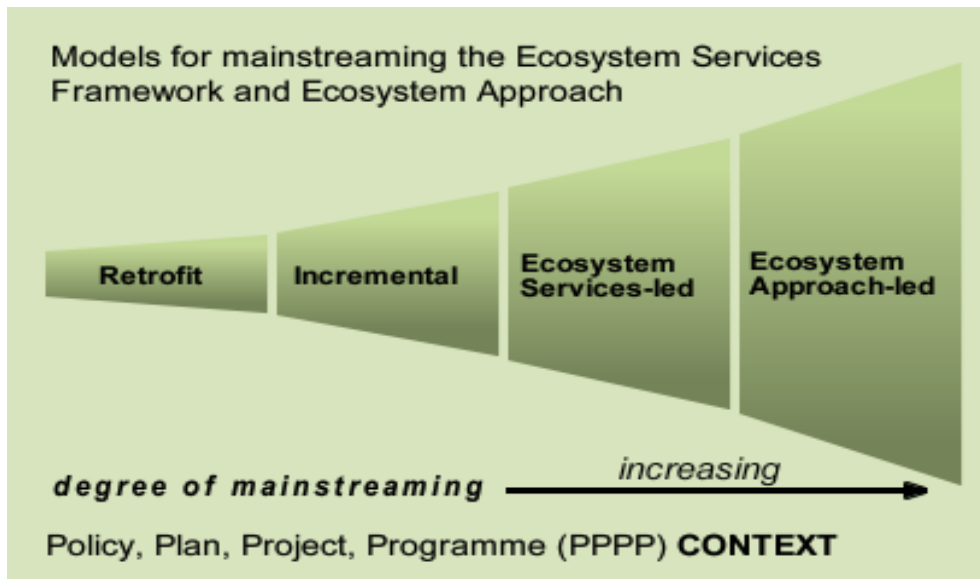


Figure 10.19. Models of mainstreaming the ESF and EA into policy and practice

10.8.1.1 The Retrofit Model – applying Ecosystem Services retrospectively

This model applies where an existing PPPP has not engaged explicitly with the ecosystem approach. This may be due to a lack of understanding or familiarity or confidence with the concept, or because using it was deemed inappropriate. For example, the Much Wenlock Neighbourhood plan was being formulated within a group not conversant with ecosystem services' thinking so it did not feature in the draft plan. However, based on our own assessment of their neighbourhood plan process, it actually addressed 11 of the 12 principles of the Ecosystem Approach to some extent. Furthermore, it was felt by the Plan's core members that there was some merit in retrofitting an Ecosystem Services Framework to the plan as part of evaluation processes and to help set future management priorities. This is currently being considered by the neighbourhood planning group whilst they await the outcomes of the inspector's report (November 2013).

Retrofitting the Ecosystem Approach or the Ecosystem Services Framework can be useful to help evaluate the broader outcomes of past policy interventions, highlighting the additionality that ecosystems science can bring. For example, the Heysham M6 assessment undertaken by ADAS in 2006 made explicit the added-value that an Ecosystem Approach could bring within a post-decision analysis of an Environmental Impact Assessment. Here a focus on environmental assets, health and well-being, cumulative impacts, limits and thresholds and wider public involvement were found to be only partially addressed in the original Environmental Impact Assessment (ADAS, 2009). Yet these form core principles of the Ecosystem Approach (principles 3, 6, 11 and 12).

10.8.1.2 The Incremental Ecosystem Services Model - including Ecosystem Services, or Ecosystem Services Thinking, within Part of the PPPP Process

This model of mainstreaming involves integrating elements of ecosystem services within existing PPPP processes rather than making any fundamental change in behaviour, actions and thinking towards an Ecosystem Approach and/or the Ecosystem Services Framework. Not surprisingly, this is favoured in several case studies as a pragmatic response given their resource limitations and the lack of current mainstreaming across the built environment.. Here key gatekeepers and decision-makers comprise elected politicians, businesses and bodies who are cautious of transformative change. It is striking that in our case study examples (e.g. Cotswolds AONB, Isle of Wight AONB, Greater Birmingham and Solihull LEP; North Devon and Torridge Local Plan), it was necessary for policy

makers to secure buy-in from often sceptical and highly conservative audiences. Thus, the most common response was to link policies and actions retrospectively to identified and/or prioritised ecosystem services agenda. Whilst this should entail using an Ecosystem Services Framework, in many cases, an incomplete subset of 'key' services were applied as bolt-ons to existing action within plans sub-optimally, but at least partially linking plan actions to the delivery and enhancement of ecosystem services outcomes. Clearly, one weakness here is that tying outcomes to a particular ecosystem service, or a narrow subset of linked services, still leaves latitude for unintended negative consequences for other non-focal ecosystem services. There was also a clear sectoral bias evident in the way ecosystem services and associated actions were contained within the environment sections of plans with little integration across other relevant sections.

10.8.1.3 The Ecosystem Services-led Model – Ecosystem Services are applied across the whole PPPP Process

This model involves the active consideration and use of an Ecosystem Services Framework explicitly from the start of a given PPPP process. Unsurprisingly, this is heavily associated with tools that are built around the application of ecosystem services such as PES schemes, ecosystem mapping and ecosystem assessment (e.g. Staffordshire LNP, South Downs NIA, South West Water PES, Corporate Ecosystem Valuation), within the SURVEY phase of a PPPP process. Mainstreaming the use of the Ecosystem Services Framework at the data collection phase allows any further analysis, policy and actions to then become embedded within that framework. In this way, the policy and decision-cycle is fully 'ecosystem proofed', thus avoiding the problems of selective 'cherry picking' of particular ecosystem services that are on the policy / organisation's radar. However, the success of this does lie in the consideration and assessment of a range of options in order to identify trade-offs between and within ecosystem services within which winners and losers are identified from specific interventions.

10.8.1.4 The Ecosystem Approach-led Model – Ecosystem Services used as an integral Element with the other Principles of the Ecosystem Approach

This model is rarely encountered explicitly in practice as it requires an explicit and up-front commitment to using all 12 principles of the Ecosystem Approach as an interlinked and interdependent set. It represents the strongest form of mainstreaming and, in many ways, provides the inspiration for the development of our [NEAT Tree](#) and our associated advice and tools which hopefully enables this to become more commonplace in future practice. The online NEAT tree translates the 12 principles of the Ecosystem Approach into such a usable framework for action, with suitable tools signposted and adjusted in pursuit of those principles.

Natural Resources Wales is the first agency globally to shape its work programme through the explicit adoption of an Ecosystem Approach, supported by the 2013 Welsh Government White Paper. It is the translation and adaption of the 12 Ecosystem Approach principles that lies at the heart of their draft framework. However, the principles need to be appropriate (i.e. adjusted to) the geographic, socio-economic and institutional setting to be meaningful and effective. Crucially there also needs to be effective governance and leadership to translate policy into practice.

It is also important to note that impact assessment processes (e.g. Strategic and Environmental Impact Assessments (SEA EIA)), in theory, incorporate many of the Ecosystem Approach principles, as their remit is to ensure that the environmental impacts are fully taken account of in the development of any PPPP, albeit with the current exception, at least explicitly, of Principle 5 (ecosystem services). Therefore, we have tried to address this within our adapted SEA and EIA ecosystem tools advice using a framework that can help mainstream the Ecosystem Approach but

without compromising the legal and regulatory requirements of the EU Directives themselves. It is somewhat disappointing to note the view in practice that impact assessments are perceived as burdens to overcome rather than as tools to help improve a PPPP process.

10.8.2 Mainstreaming Approaches for different Stakeholder Groups

Different sectors and stakeholder groups working within a particular PPPP have different needs and capacities when it comes to engaging with the Ecosystem Approach and how to put to theory into practice. In the following section, we recognise this diversity explicitly and suggest pathways and hooks that can be used to engage these sectors more actively in ecosystem thinking and mainstreaming actions. We have focussed attention on four end-user groups: the built environment, business, local community and the natural environment. Specifically, we build pathways through the identification of relevant 'hooks' on which the ecosystem approach could be mainstreamed, recognising that each sector has its particular opportunities and where, a one size fits all approach, will not work. Having identified these hooks, we then signpost the tools which might be most useful and what outcomes they would seek to inform.

10.8.2.1 The Built Environment Interest⁶³

The starting point for engagement with the built environment sector in **England** is the twin hooks of the Duty to Co-operate (DTC) requiring strategic consultation at appropriate spatial and temporal scales within cross sector partnerships and the NPPF paragraph 109 on recognising the value of ecosystem services which, is the first time, national planning guidance has explicitly mentioned ecosystem services as part of a strategy for enhanced ecological connectivity (DCLG, 2012). For **Scotland** the initial hooks are provided through the Land Use Strategy (2011) through its specific actions for embedding the Ecosystem Approach whilst the emerging National Planning Framework 3 (*Ambition Opportunity Place*: Scottish Government, 2013), recognises explicitly the value of ecosystem services within its 'A Natural Place to Invest' Chapter 3. For **Wales** the hooks are through their unique statutory duty towards sustainable development and the White Paper consultation 'Towards the Sustainable Management of Wales' Natural Resources' as part of the Living Wales Programme (Welsh Government, 2013). Furthermore the proposed Wales Planning Bill (2014) provides an important opportunity for this thinking to become embedded in built environment legislation. Significantly, the use of ecosystem services provides a much more positive framework within which such regulation can be implemented. Incentives can encourage behaviour change responses within more positive views of the environment as an asset particularly within new market instruments such as payments for ecosystem services.

Duty to co-operate (DTC)

Under the Localism Act 2011, the DTC is a key concept that requires a local authority to cooperate with all relevant bodies in the preparation of the statutory development plan (local plan) which represents the primary consideration for the resolution of planning applications. At present, this is being rather narrowly interpreted to focus on housing markets and employment land matters with discussions and agreements between immediate neighbouring local authorities rather than actively considering the full range of interests that are relevant to spatial planning matters (e.g. health, water, social services and education). The Greater Birmingham and Solihull Local Enterprise Partnership case study is illuminating here in that it is actively using all nine West Midland Authorities in an exciting initiative to try to broaden the use and value of the DTC, although it is still heavily geared to local authority and private sector involvement with community and environmental interests not well represented. Moreover, the issues over which the group is co-operating are strictly

⁶³ <http://www.eatme-tree.org.uk/built-environment.html>

limited and self-selecting. However, by linking the DTC function with principle 7 of the Ecosystem Approach (addressing appropriate spatial and temporal scales) through the identification of interrelationships and dependencies, new, more inclusive, partnerships can be built that cut across traditional scales and sectors. Crucially, this helps strengthen the initial evidence base and views that inform the IDEAS and SURVEY phases of a given PPPP. By working across different scales, hidden dependencies are uncovered which can assist the realisation of environmental objectives but, in so doing, also address quality of life issues such as flooding and water quality/scarcity that can cause significant problems and cost to the economy. In essence, this becomes the catalyst for incorporating the other principles of the Ecosystem Approach associated with equity, limits and subsidiarity (principles 1, 2 and 6).

Drawing on the results of the South West Water PES upstream thinking case study, it becomes clear that there are significant cost savings and multiple environmental and quality of life benefits from implementing this type of scheme. This approach will require many stakeholders to move outside their usual cooperation comfort zones and silos at the outset of a plan if the maximum potential for mainstreaming as shown in **Figure 10.20** is to be realised.

Value the importance of ecosystem services (NPPF 2012, par.109)

The NPPF is the key national guidance for the built and natural environment professions. The incorporation of ecosystem services explicitly into this via paragraph 109 is, therefore, highly significant; although under a relatively weak duty to 'recognise'. This inclusion has fuelled the development of ecosystem mapping tools like Invest and SCCAN to achieve this goal and, it is at the IDEAS and SURVEY stages that this is likely to be most valuable and influential, as highlighted in the TABLES decision-making flowchart (**Figure 10.20**). Here, ecosystem mapping, as undertaken by Bridgend and Neath Port Talbot Councils, as part of the SCCAN method case study, provides a solid evidence base upon which to build further ecosystem service initiatives. In particular, this can help identify key areas of 'natural infrastructure' that can be protected and enhanced within urban areas to deliver multiple benefits. This approach can also inform ecosystem assessment processes that can provide annual accounts of the value of green infrastructure, with incentives to improve this year-on-year, as exemplified within the Staffordshire and Birmingham case study examples. Valuing of nature in this way becomes helpful when decision-makers have competing priorities and financial budgets to balance.

Given the importance of local plans as the key statutory land use documents for shaping the delivery of planning through development management processes, there is also an important opportunity to use the SEA tool to ensure that any proposed PPPPs are assessed against an Ecosystem Service Framework. Building from the IDEAS and SURVEY phase of a local plan, the SEA process can help assess the best options in terms of their likely impact on ecosystem services and, in so doing, support recognition of the value of ecosystem services into the PPPP process. Added-value is also likely for major development projects or masterplans, for example when using an EIA incorporating the Ecosystem Services Framework.

Once an ecosystem services baseline has been mapped, there are significant opportunities to use a range of schemes which may enhance ecosystem service provision within an area such as PES which has a role to play in conjunction with the judicious use of our guidance.

Built Environment: Hooks, Tools & Outcomes

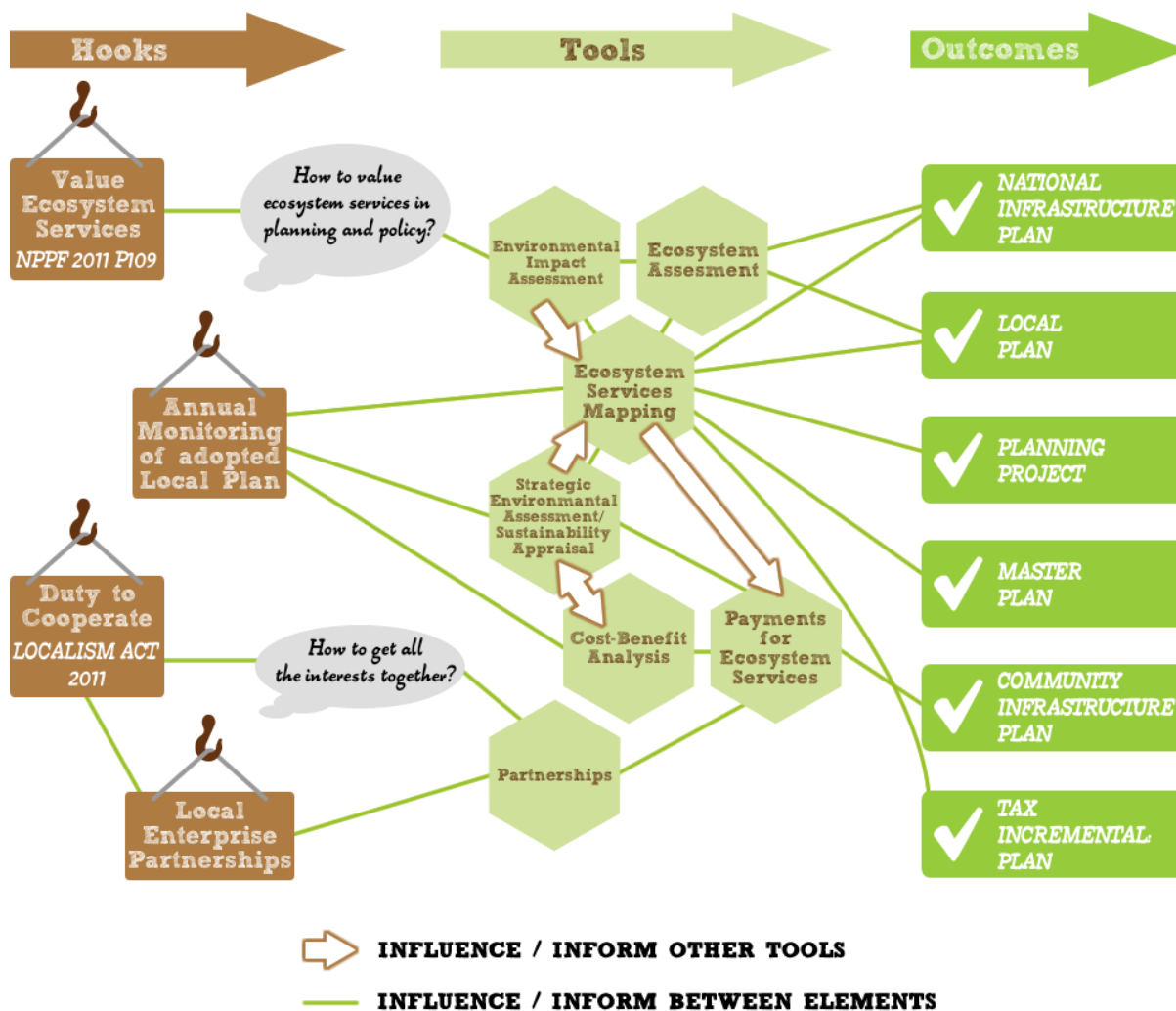


Figure 10.20. The hooks, tools and outcomes for ecosystem mainstreaming in the built environment.

10.8.2.2 The Business and Private Sector Interest⁶⁴

The starting point for engagement with the business sector is the twin hooks of environmental risk and opportunities that businesses face from changing/declining ecosystem services, both of which influence corporate performance (Figure 10.21). More specific hooks lie within Environmental Management Systems such as the ISO 14000 family and (Eco-Management and Audit Scheme (EMAS) as well as Local Enterprise Partnerships (LEPs).

⁶⁴ <http://www.eatme-tree.org.uk/business.html>

Business & Private Sector: Hooks, Tools & Outcomes

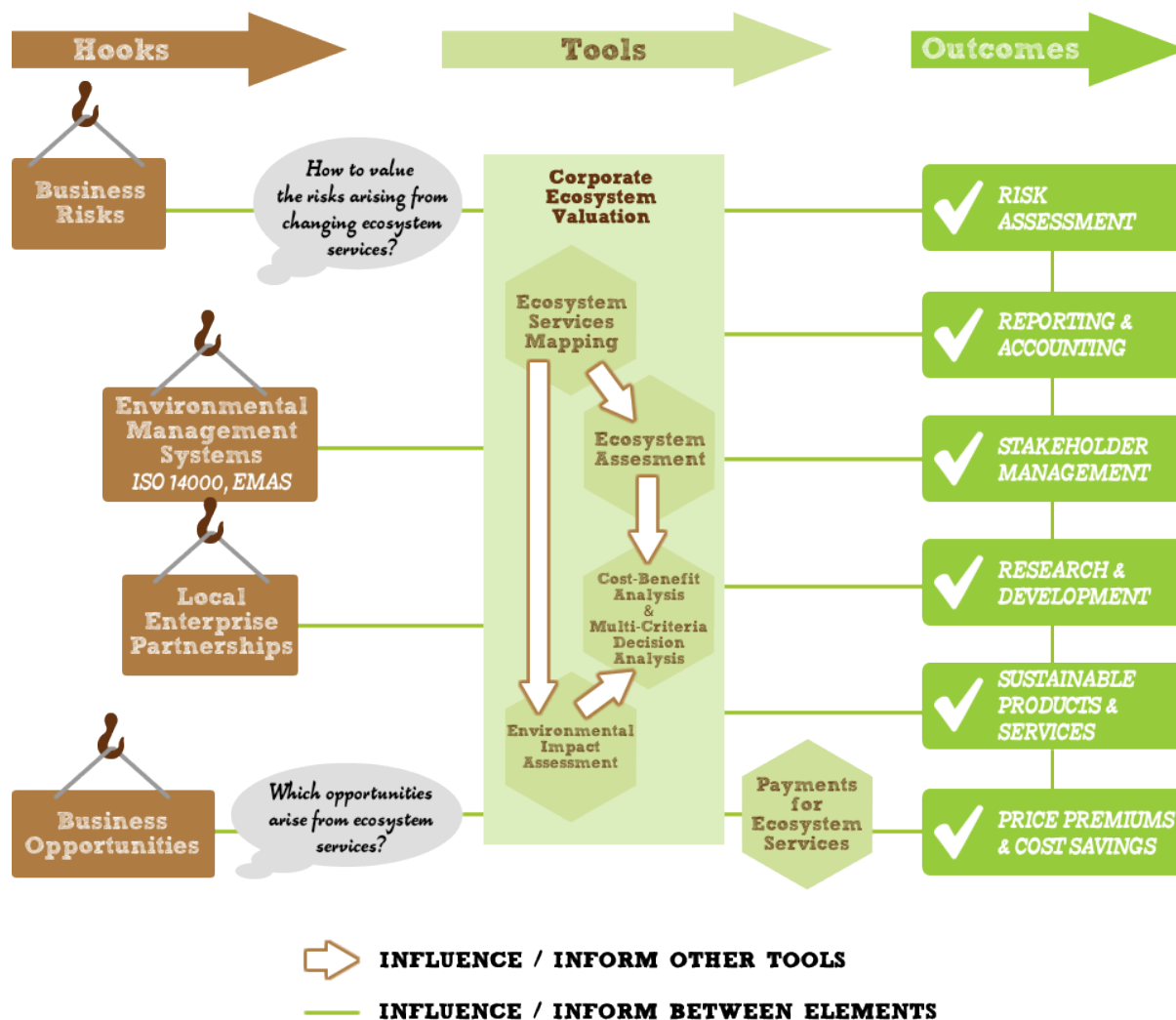


Figure 10.21. The hooks, tools and outcomes for ecosystem mainstreaming in the business sector.

Business risks from changing ecosystem services

Many businesses depend on the products and services that the natural environment provides, whether directly or indirectly. In the past such ecosystem services and their sustainable provision, over time, were usually taken for granted. However, drivers of change such as resource depletion, environmental pollution, climate change, population growth (including related land-use changes) are putting substantial pressure on ecosystems and the goods and services they provide. In the UK, about one third of ecosystem services are declining or degrading (UK NEA, 2011a). Other dependencies on natural resources are indirect, for example outdoor clothing and fishing trades depend on a high quality natural environment that customers not only require to enjoy (and purchase) their products but which may give the company brand identity.

The Corporate Ecosystem Valuation (CEV) tool is specifically designed to help businesses to better reveal and implement the value of ecosystem services and how they influence business performance (WRI, 2012). It serves corporate decision-making by identifying and valuing ecosystem impacts by businesses, together with the risks and opportunities businesses face from changing ecosystem services. CEV acts as an 'umbrella-tool' which incorporates and/or can be informed by other tools

such as Ecosystem Services Mapping or Multi-Criteria Decision Analysis (MCDA). The outcomes can, for example, be implemented in risk management which is sensible especially when businesses depend upon the sustainable provision of specific ecosystem services. CEV can also be used to compare different product designs regarding their impact on ecosystem services. This can help to design products with improved impacts on ecosystem services to match social and environmental goals.

Businesses should not only be concerned about dependencies, but also their own impacts on the natural environment and ecosystem services. A poor environmental performance can cause significant indirect impacts, such as reputational, regulatory and legal risks, market and product risks, and financial risks (Hanson *et al.* 2012). Furthermore, factors such as investor confidence, staff morale and retention, delays in securing planning permission and higher interest on loans due to poor risk management, all add to the risk equation with customers, shareholders, investors and other relevant stakeholders increasingly concerned (Everard, 2009).

There are, however, fundamental barriers that prevent the full realisation of the value of ecosystem services. Market mechanisms and the incentive structures of the actors within corporate decision-making processes may incentivise sub-optimisation to prioritise short-term goals over long-term optimisation of corporate performance and risk management. Another barrier is a lack of ecosystem services-related expertise within businesses, concomitant with a lack of knowledge transfer between the scientific and the business community. These factors make it difficult for many businesses to identify and manage the long-term risks that they face from changing ecosystem services. Currently, there are limited incentives to spend resources on relevant assessments and the application of relevant tools because it is often unclear how such spend would contribute to corporate performance; Corporate Ecosystem Valuation and the LEED tools are examples within our tool reviews that are being used to address this. Furthermore, businesses may underestimate the magnitude of how changing ecosystem services may influence corporate performance in the medium and long terms.

Initiatives such as the Ecosystem Markets Task Force and TEEB for Business may help overcome some of these barriers, although their supporting material and incentives tend to appeal to larger businesses which have more headroom and longer-term planning horizons. Best-practice case studies implementing the value of ecosystem services in corporate decision-making across regions, business sectors and business scales will make the advantages of ecosystem services-related risk-management tangible for a range of business types and sizes. However, at this stage it is not likely that such 'showcase projects' will be realised without external funding and expertise. More investment in case studies leading to the development of practical sector-relevant toolkits and guidance will be valuable for accelerating uptake along supply chains and into smaller businesses.

Because of their competitive and win-orientated nature, businesses will not always have the incentive to protect and enhance ecosystem services if short-term gains are significant compared to known risks. This applies especially for activities where no win-win solution can be achieved, or has not yet been innovated. Some market failures such as environmental externalities and the 'tragedy of the commons' will not be solved without external (governmental) intervention, cross-business commitments (including reliable regulatory control and enforcement mechanisms), or strong voluntary agreements such as those that are brokered by trade associations.

Ecosystem services-related business opportunities

Whilst negative impacts on the environment can generate substantial business risks, sustainable products and services can also offer opportunities for new markets and customers. If communicated appropriately, such products may also allow a price premium. The sustainable use and management

of ecosystem services can also reduce costs. Mechanisms such as PES may be used to manage ecosystem services for which a business has no property rights. In this context CEV can be used to assess the value of specific business-related ecosystem services and to reveal which stakeholder groups benefit and dis-benefit from changes to these ecosystem services. This information can be used to identify sellers, buyers and the appropriate value in a PES scheme. Sound stewardship of ecosystems and their services can also, and has already, been, applied as the basis for cause-related marketing (Everard, 2009).

However, business opportunities arising from ecosystem services do not automatically ensure a sustainable and welfare-optimal realisation of such opportunities. There is always a danger of resource-overexploitation when making use of ecosystem services. This may be the case when ecosystems are optimised for the provision of a specific ecosystem service relevant for the business success whilst reducing other ecosystem services. For example, where land is managed to optimise provisioning services (e.g. biofuels) regulating, cultural and supporting ecosystem services (e.g. climate regulation) may be degraded. This illustrates why a systems overview should always be taken rather than implicitly assuming that maximising one service will deliver net societal benefits.

How can businesses benefit from taking an Ecosystem Approach?

Businesses that have already achieved or are working toward implementing Environmental Management Systems such as the [ISO 14000](#) family or the EU [Eco-Management and Audit Scheme](#) (EMAS) can benefit further by adopting an ecosystem approach. By considering the wider context of their activities and its location, businesses can for example:

- improve health and well-being in the workforce by taking opportunities to improve the local environment;
- support local partnerships addressing flood and other environmental risks, so improving overall local resilience and reducing their individual costs;
- anticipate and work with regulators to secure long-term environmental quality, potentially reducing regulatory burdens and also enabling future expansion and investment to be better designed and to proceed more speedily;
- demonstrate their business commitment to the local and global environment which can be reported publically and in environmental audits;
- work with Local Enterprise Partnerships (LEPs) to undertake systematic reviews to embed environmental performance in the wider economy and deliver a wider range of benefits which will enhance business competitiveness. Local Enterprise Partnerships (LEPs) can connect with Local Nature Partnerships (LNPs) within new governance opportunity space to share expertise and explore collaboration between businesses and organisations working towards environmental management and conservation goals.

10.8.2.3 The Local Community Interest⁶⁵

The starting point for engagement with the community sector is the appreciation by policy and decision-makers that consultation and engagement with the local community is a statutory requirement within most PPP processes. Here local plans under the umbrella of the NPPF become highly influential yet controversial. This then, by default, provides a gateway for community groups to actively consider and/or value ecosystem services providing they are familiar with them and/or are confident to do so (**Figure 10.22**). However, this normally represents a reactive hook, given the way many engagement processes take place. There is also emerging evidence that such processes are becoming little more than tokenism with tick-box exercises engendering increased consultation

⁶⁵ <http://www.eatme-tree.org.uk/local-community.html>

fatigue and scepticism among publics and those who feel their voices are not being heard (Scott, 2012).



Figure 10.22. The hooks, tools and outcomes for ecosystem mainstreaming in the community sector.

However, there are more proactive hooks emerging associated with localism and green agendas. Here the idea of community empowerment and action, set within quality of life considerations, provides a powerful rallying call that motivate and enthuse communities. In particular, there are legislative hooks within the Localism Act 2011 which, in theory, provide for a transformative shift of power away from the centre to local communities, albeit recognising issues of capacity and representation. Specifically in the form of:

- asset transfer;
- community management or common ownership;
- community economic development;
- neighbourhood plans;
- Local Nature Partnerships (LNPs) and Nature Improvement Areas (NIAs) requiring community involvement.

Furthermore, the Public Services (Shared Value) Act 2012 seeks to impose obligations on service providers to recognise how the services they commission impact and benefit the social and economic well-being of communities. This presents an opportunity for principle 1 of the Ecosystem Approach associated with societal choice and equity to become embedded in the procurement

process for the delivery of PPPPs. Associated with the localism hook, but standing as its own hook for engagement, is the wider “green agenda” which is becoming a powerful force within some forms of community development activity. This takes different forms ranging from protest and opposition to supporting green space, urban agriculture and local climate change mitigation strategies.

These two types of hooks are linked because community willingness to engage with mechanisms to influence or control ecosystem services will stem from that community’s attitudes to ecosystem services and understanding of benefits received. Both are also contingent upon local notions of community: roles and responsibilities of individuals to the community and to the natural environment.

There is also a virtuous circle with community empowerment; communities who are informed of ecosystem impacts and benefits will then engage with processes and discussions which will enable their progress up the ladder of empowerment to fuller, more informed control over local resource processes and information. Equally poor ecosystem understanding can exacerbate disempowerment, marginalisation and increased frustration.

Community involvement contributes knowledge exchange and the inclusion of professional and lay expertise. Communities may hold quite weak positions of influence as they do not necessarily have access to officially recognised data sets or formats; yet they hold their own unique and rich experiential knowledge and observational data. It thus becomes important that such expertise is effectively captured and embedded in PPPP processes.

Most case studies show a relatively small community involvement component which demonstrates the relatively nominal role of targeted community input into programme outcomes in practice despite the localism rhetoric. Processes such as neighbourhood planning may strengthen and widen community input, but to ensure community engagement and ecosystem approaches become mutually supportive requires efforts from those in positions of influence to help frame community options in ecosystem terms.

10.8.2.4 The Natural Environment Interest⁶⁶

The starting point for engagement with the natural environment sector is through the regulatory environment and incentives associated with emerging market based instruments (**Figure 10.23**). Within the emerging language of these hooks is a significant shift in emphasis away from the environment as constraint to the environment as an asset both intrinsically and economically. This recognises that traditional efforts have largely failed to safeguard nature with the UK NEA (2011a) recording significant declines across most ecosystems.

The principal regulatory hooks are through the key ecological EU directives; specifically the Water Framework, Habitats and Birds Directives and the RAMSAR convention). Furthermore, Impact Assessment Directives associated with an ‘appropriate assessment’ covering SEA (Habitat and Species Regulatory Assessments) and EIA and potential impacts on NATURA 2000 sites, provide further hooks for engagement. Hence our attention has been to work with the SEA and EIA processes. It is through these assessment techniques that necessarily involve a multiplicity of tools; from scenarios to mapping to cost benefit and multi criteria decision-analysis that, in theory, represent the highest impact for improved interventions through the PPPP processes and outcomes. In the context of European legislation the European Landscapes Convention is perhaps the least known and understood in terms of providing a hook for engagement with cultural ecosystem

⁶⁶ <http://www.eatme-tree.org.uk/natural-environment.html>

services. Thus there is a risk that these services might be overlooked. It is interesting here to note Natural England’s [National Character Areas](#) initiative as a response to this concern.

At the national level there is the Natural Environment White Paper 2011 which was spawned from the UK NEA (2011a) report and John Lawton’s review which, together with Biodiversity 2020, provides an action plan for the environmental sector. Indeed, under proposed cutbacks to the Defra family of agencies it is likely that the statutory functions these agencies pursue will be the primary hooks for their future work programmes. It therefore becomes important to focus on the SURVEY phase of the policy cycle as that provides the evidence base upon which decisions can be made and where societal and inter and intra ecosystem service trade-offs have to be accounted for.

Increasingly the planning system is becoming a hook for the natural environment interest. Here the NPPF has a significant impact, but as discussed previously it merely provides a reactive hook for development control/management processes. Far better is the use of more proactive hook within the development plan process (local plan) involving SEA processes and local plan consultations.

Natural Environment: Hooks, Tools & Outcomes

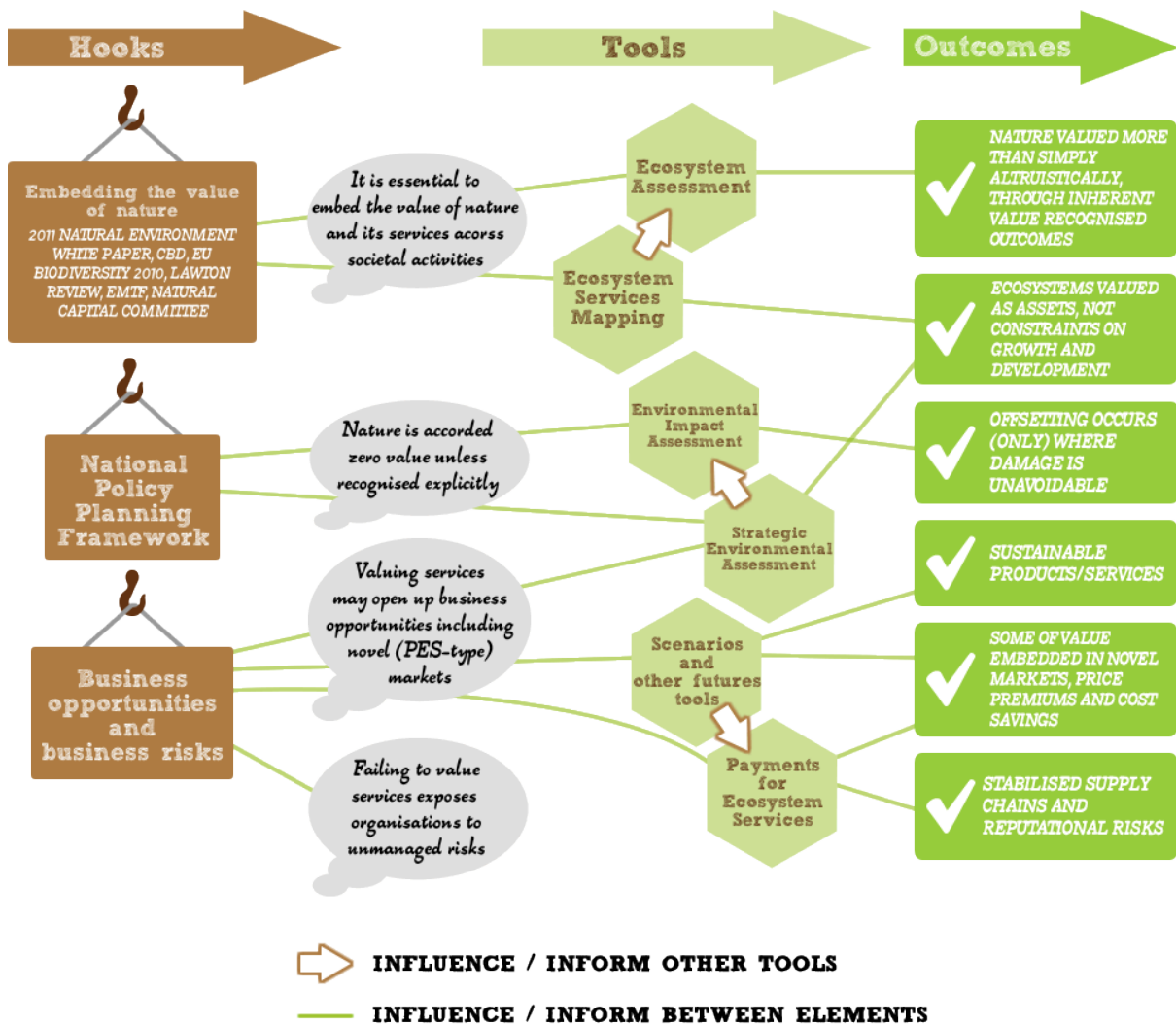


Figure 10.23. The hooks, tools and outcomes for ecosystem mainstreaming in the natural environment.

The shift from regulation to incentives in environmental conservation

Environmental concerns have a long history of seeking improved protection of species, habitats, geo-diversity and landscapes that are considered rare and valuable. The most common intervention has been based on regulation involving some form of designation and legislation. These 'lines on a map' whilst attractive for decision-makers, have attracted significant criticism relating to their efficacy, equity and negativity resulting in the consideration and use of incentives to promote stewardship and behaviour change (Scott and Shannon, 2009). In making this transition from protectionism to resource stewardship there is a significant problem as many extant designations of landscapes, species and habitat have addressed value systems based on intrinsic value which may not connect well with other value systems such as those of business and spatial planning. Current protection tends to focus on some habitats and species in a piecemeal manner and rarely considers ecosystems in their totality. Thus underlying functions and processes (supporting services) are poorly dealt with. This may lead to disintegration in site designation and management objectives (Scott *et al.* 2013).

A key strength of using an Ecosystem Services Framework is that it forces more holistic consideration of the environment as part of an interlinked system, allowing the identification of beneficiaries and losers in the various trade-offs within PPPP decision-making. It is here that market-based instruments may offer significant potential. PES allow certain ecosystem services to be paid for by beneficiaries. For example more favourable catchment management can result when the value of natural processes for water resources and flood risk management are appreciated. The dependencies in this system mean that water companies and residents may benefit from flood protection and water storage in the uplands. Likewise, urban and peri-urban forests not only provide carbon storage but also contribute to microclimate regulation, management of floodwater, noise and visual buffering, cleansing of air and amenity, all of which enhance the 'liveability' of settlements as well as the real estate value in their proximity. In both these cases there are economic costs that can be used in market based mechanisms.

However, there is a risk that the economic valuation of nature within selected ecosystem services may give rise to an oversimplistic commodification of nature that confuses monetisation of some services with intrinsic value and the multiplicity of often incommensurable values. If this misunderstanding crosses into the political domain, accountancy may perpetuate the current status quo of 'trading off' the environment to benefits in narrow market terms. Here, irreplaceable assets such as peat bogs and ancient woodlands may be lost with inadequate replacements. Hence the use of SEA and EIA procedures within an Ecosystem Services Framework where the mitigation hierarchy is used becomes vital to help overcome this risk.

10.9. Conclusion and Key Areas for Future Research

This project has made substantial progress in what is a major opportunity space for research on the mainstreaming of ecosystem thinking through the development and use of a tools framework. In particular our explicit attention on the Ecosystem Approach addresses a major deficiency in previous research that focuses on the primacy of Ecosystem Services in isolation. At the time of writing other projects are emerging that pursue similar goals; for example OPERA⁶⁷ and the Natural Resources Wales Ecosystem Approach guidance. However, there is a rich but increasingly mushrooming research environment within ecosystem science that clearly needs improved co-ordination and shared understandings to help synchronise and progress mainstreaming efforts.

Our TABLES project has established a framework and supporting advice and materials for the translation of the ecosystem approach through an active process of co-production and transdisciplinary working. This will hopefully secure the buy in from different stakeholders to our outputs in general and our NEAT tree web portal in particular. It also builds a rich legacy through the work of our case study champions as they boldly go into ecosystem thinking.

As part of our mission we have identified important gaps in evidence and knowledge and crucially uncovered the need for a significant behaviour change in the way that current policy is made; increasingly policy-based evidence corrupts the conventional logic of a policy cycle where issues of power, influence, ideology and self-interest feature, maintaining (the *status-quo* which is difficult to challenge (Scott et al. 2013). Given the limited timescale and resources for our project, we were unable to cover these aspects in any detail but they remain crucial considerations given the proverbial saying that 'every bad (policy-/decision-maker) workman still blames their tools'. The remainder of this section therefore tries to identify future research agendas which have been uncovered in the course of this project's investigations.

First, it is important to realise that the Ecosystem Approach is but one lens within which to make sense of the complex reality of resource management decisions. There are considerable advantages in using other lenses to help maximise shared understandings and it is here that connections with ideas in Spatial Planning and Building Information Modelling may provide important conceptual steps forward. Research undertaken by Scott *et al.* (2013) highlighted the synergies between the Ecosystem Approach and Spatial Planning paradigms. There is considerable merit in exploring how these ideas work in particular settings. Our case studies provide a set of different baselines from which we can monitor the interface of spatial planning with the Ecosystem Approach over time. The use of pilots in this way can provide important lessons for mainstreaming efforts more generally.

Second, there is significant neglect on the issue of equity in ecosystem research. Research needs to better understand the winner and losers from the current spatial configuration of ecosystem services and the impacts of particular policies and interventions such as payments for ecosystem services and biodiversity offsetting schemes on social and environmental justice. In particular, there is the need to target interventions in those areas that are most ecosystem service deficient. At present, within Strategic Environmental Assessments for example, there is limited consideration

⁶⁷ OPERA is a collaborative project that aims to bridge the gap between ecosystem science and practice. The project will advance current understanding of ecosystem functioning, including its relationship with Ecosystem Service provision, by testing and further developing methods that value the flow of Ecosystem Services (ES) from the stock of Natural Capital (NC), and by establishing what constitutes good ES/NC governance and ecosystem management <http://operas-project.eu/>

given to social impact assessments and despite the emergence of such tools, their presence in policy-making considerations remains somewhat elusive. Moreover, from our own case studies there is emerging anecdotal evidence that some activities such as Local Enterprise Partnerships, local plan and neighbourhood plans are not addressing the needs of the most deprived communities.

Third, the extent to which policy-making and political decisions across national and local governments are seriously influenced by the Ecosystem Approach is unclear. For example, contemporary and controversial projects like HS2 and fracking have not been subjected to a rigorous ecosystem assessment process that helps to inform or validate the various options. The biodiversity offsetting consultation also suggests that there is huge potential for using ecosystem services but there are significant risks of one size fits all values oversimplifying the range of ecosystem services provided in particular habitat settings. Interventions in habitat and landscape management should be assessed as to where and how these are most effective and able to 'optimise' and secure multiple societal benefits. This raises a fundamental question as to what changes are necessary in the policy landscape to accelerate the mainstreaming of the Ecosystem Approach.

Finally, there is currently little research and clear evidence as to the power relationships between the different ownership models of the assets from which ecosystem services are derived. For example, does community ownership deliver enhanced ecosystem services? Research is also required to value ecosystems services at the point of consumption of both private and public goods, including the adequate internalisation of how services are produced.

10.10. Links with other Work Packages

The TABLES project was able to benefit from ad-hoc individual staff linkages with selected work packages (WPs) at particular phases of the project as detailed in **Figure 10.24**. However, the short timescale of the UK NEAFO project was problematic as our methodology and requirements for input (at the early stages) did not synchronise well with the emerging findings and material from the other WPs (later stages). It is important to appreciate that the timescale of WP 10⁶⁸ was different to the other work packages and thus presented particular challenges for integration. This was an inevitable weakness of the short time scale of the UK NEAFO project and thus required the TABLES team to be largely free standing and not being able to benefit fully from the expertise and emerging results within some WPs.

Our linkages from other WPs crucially informed the tool typology and literature review stages. Individual linkages were facilitated and cultivated through members of our TABLES team separate involvement with other WPs (Scott, Baker, Everard and Reed). In particular WPs 1, 5, 6, 7, 8 and 9 all provided significant support and input. In terms of tool development we were able to incorporate the output of WP1 (Natural Capital Asset Check) explicitly into our ecosystem tool kit and NEAT tree. In addition WP1 and WP6 contributed significantly to the tool review process.

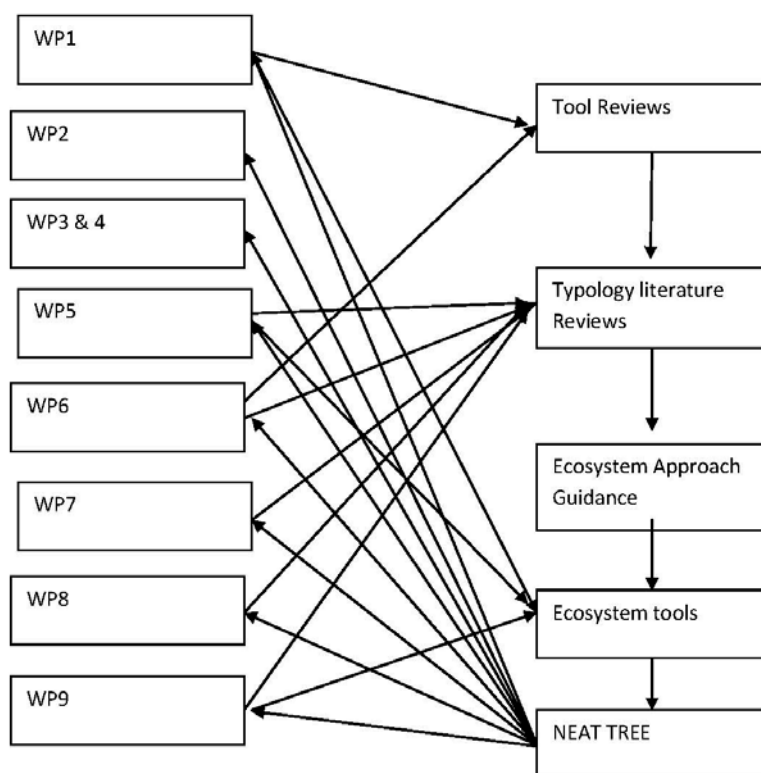


Figure 10.24. Linkages with other Work Packages in the UK NEAFO process.

Our linkages to other WPs was equally constrained but through our early circulation (April 2012) of our draft NEAT tree web portal, important intelligence was provided.

⁶⁸ Initially within the NEAFO process there were two tools work packages. The first was the development of a tools framework with the second involved in its testing and refinement. We agreed to merge these into one overall workpackage.

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