

Review of methods for integrating cultural ecosystem services, values and benefits in forestry

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Executive summary

This report focuses on methods for the integration of Cultural Ecosystem Services (CES) into decision-making about the management of trees, woods and forests (TWF). It specifically focuses on two types of integration:

- 1) Integration of CES and benefits alongside other ecosystem services (Provisioning, Regulating, Supporting)
- 2) Integration of ecosystem services including CES within decision-making.

Existing evidence suggests that the CES of TWF are often poorly represented in both analysis and decision-making, often because of the difficulties associated with quantifying and monetising them. The recent Natural Capital Accounts for the Public Forest Estate (PFE) in England, for example, only includes values that can be readily monetised. As a result, only one aspect of CES, namely recreation, is used to represent the broad range of CES associated with the PFE. Furthermore, recreational value is represented by a calculation of people's willingness to pay for a single forest visit which, it could be argued, is an inadequate way of expressing the range of values that the PFE represents.

This work involved a literature review that sought to:

- 1 Identify what methods are used to capture the value of CES.
- 2 Explore what methods are used to try and integrate qualitative, quantitative and monetary values for CES and benefits, and in what situations they are used.
- 3 Identify what existing evidence reveals about the use of these methods.

The review found that a wide range of methods are being used to identify the CES and benefits of TWFs. These encompass benefits such as cultural, symbolic, and spiritual importance, health and wellbeing, education and learning. These benefits need to be better understood and recognised by land managers, as protests and conflict can arise if they are not.

A number of key integrative methodological approaches to capturing the value of CES were identified in the literature. Much of the evidence reviewed underlines the benefits of including a deliberative dimension to valuation, because it provides opportunities for stakeholders to express both the full range of CES associated with a particular place, and the range of values associated with those CES. This is particularly important for the representation of CES, because they are often more complex and less familiar than other ecosystem service categories within the context of established analytical and political procedures that inform decision-making about the natural environment. The review also identified a number of mixed method approaches. These include participatory GIS, and other approaches that combine deliberative and technical dimensions. These mixed method approaches, with a strong deliberative component, are better able to address:



- 1. ethical issues and concerns about the implicit commodification of ecosystem services
- 2. the need to take account of community values through exploration of attachment to place,
- 3. the need to include less tangible, but nonetheless important values that people may find difficult to express without time allocated to discussion and elicitation.

The review also highlights a number of useful 'how to' guides for the integration of ecosystem services into decision-making.



1. Introduction

The UK National Ecosystem Assessment (UK NEA, 2011) concluded that ecosystems are important to people's wellbeing and to economic prosperity; however it also outlined that they are consistently undervalued in decision-making and conventional economic analysis. The UK NEA Follow-on projects (UK NEAFO, 2014) built on the work of the UK NEA and researched some of the gaps identified in the first assessment. Advances were made in researching and conceptualising cultural ecosystem services in the UK NEAFO, particularly via the chapters on 'cultural ecosystem services and indicators' (Church et al. 2014), 'shared, plural and cultural values of ecosystems' (Kenter et al. 2014a) and 'economic value of ecosystem services' (Bateman et al. 2014). Ecosystem services are widely seen as the benefits ecosystems provide that are vital for human well-being and are frequently divided into supporting, provisioning, regulating and cultural ecosystem services. This short review provides a summary of the wide range of methods used to capture cultural ecosystem services, values and benefits, with a more particular focus on the use of methods that try to integrate different types of value: qualitative, quantitative and monetary.

The terms 'services', 'values' and 'benefits' are often used interchangeably throughout the literature. We use the following definitions in this report:

- Services are the contributions that ecosystems can make to human well-being by supplying a public need (Haines-Young and Postchin, 2013).
- Benefits are something that promotes or enhances wellbeing.
- Values are an enduring concept of worth and importance and are informed by ethical and moral judgements and by creating priorities in ideas and belief systems (O'Brien, 2003).

We use all of the above terms in this report as these are all used in the literature we reviewed. As an example of how these terms might be applied, a group of conservation volunteers carrying out coppicing activity are being shaped by the woodland (they learn skills, and are influenced by their shared experiences of the woodland). In turn they shape the woodland by carrying out their coppicing practice (creating greater diversity and structure in the wood). Ecosystem services, many of which are cultural ecosystem services, emerge out of this dynamic engagement between the woodland and the practices of the volunteers. From these services the volunteers may gain a range of benefits that can enhance their wellbeing (skills development, mental wellbeing, social connections, physical exercise etc.). They may value these benefits in various ways. One volunteer may value the physical activity most while another may value skills development as they seek to gain employment or enrol onto a college or university course. The volunteers may also value woodlands they have never visited, knowing these woods can provide benefits to other volunteers, local communities, and future



generations. Values can change over time and differ in various contexts. Values can be deeply held and conflicts may arise if people feel their values are threatened by, for example, the loss of trees or woodlands or changes to familiar and favourite places.

This report focuses specifically on methods for two types of value integration:

- 3) Integration of cultural ecosystem services / benefits alongside other ecosystem services (provisioning, regulating supporting)
- 4) Integration of ecosystem services including cultural ecosystem services within decision-making.

Evidence suggests that many studies leave out the full range of cultural ecosystem service (CES) relevant to a particular context as many of these services are not easily guantified or monetised. However, these values need to be taken account of in decisionmaking in an equal way alongside other ecosystem values. To take an example of the value of urban trees that are currently being identified using specific valuation methodologies in which a monetary value is identified for a range of benefits. Economic valuation of non-marketed ecosystem services has generally been founded upon preferences expressed by individuals, including stated preference approaches that use survey methods such as contingent valuation and group based approaches, such as choice experiments. They also include revealed preference approaches or hedonic pricing that estimate implicit value from wider economic relationships (e.g. amenity values from property prices). Sarajevs (2011) conducted a review of three different urban tree valuation approaches: 1) i-Tree, 2) Capital Asset Value for Amenity trees (CAVAT) and 3) Helliwell. All three place monetary values on a range of benefits provided by urban trees. I-Tree Eco is a software application to quantify the structure and environmental effects of urban trees and calculate their value to society. The Helliwell system is based on expert judgement, and focuses on visual amenity value. CAVAT is a method for managing public trees as assets rather than liabilities. Not all urban trees provide all CES for example; street trees do not provide recreation services. However, none of these three methods are able to comprehensively quantify the cultural and social benefits of trees as identified in Table 1 which provides a list of the range of CES values for trees and woodlands. Therefore, because these values are not quantified via these methods they are not included in the valuation. In particular, they all omit the recreation, tourism, spiritual, and community development benefits of urban trees. That does not mean that these methods have not been useful for identifying some of the value of trees, for example i-Tree Eco has raised awareness of the importance of urban trees and their contribution to a range of primarily regulating urban ecosystem benefits.

The recent Natural Capital Accounts (NCA) produced for the public forest estate (PFE) in England (Forestry Commission England, 2016) also illustrates some of the challenges of including CES alongside other ES categories to capture the full value of trees and woodlands. Only those values that can be robustly monetised were included in the accounts and this is strongly acknowledged in the report. Services such as air and water



quality and flood risk mitigation were not included as more research is needed to assign a monetary value to these services from woodlands. In terms of CES, recreation was used to denote this value and visits to the PFE were the proxy measure used, based on a study undertaken in 2003 (Willis et al. 2003). Visitors were asked their willingness to pay for a single visit to a forest site, and this was estimated at £1.66 to £2.75 for each visit. This type of approach has been critiqued as not adequately capturing the CES people gain from engaging with trees and woodlands and many argue that mixed methods and integrative approaches are needed to capture the full range of CES (Kenter et al. 2014).

The Office for National Statistics commissioned a consultancy to develop an approach for valuing CES for inclusion in NCAs (Ricardo Energy and Environment, 2016). Following a review of studies to identify potential methodologies the simple travel cost method was selected as suitable as it can be based on accessible data such as the Monitor of Engagement with the Natural Environment survey undertaken in England (Natural England, 2016). However, the report acknowledged limitations as the travel cost method only provides values for those visitors that spent something in travelling to a recreation site, and therefore the large numbers of free visits made to these types of sites are not valued. The reviewers identified three methods to potentially value these free visits but did not include them in their report as they stated their inclusion in ecosystem accounts was not accepted as robust enough in current literature. Binner et al's. (2017) report focuses on valuing the social and environmental contribution of woodland and trees in England, Scotland and Wales, it outlines some of the challenges faced in identifying physical and mental health benefits in economic terms. It highlights that recreation values are reasonably robust; however it states that there are still significant gaps for the economic contribution of woodlands to be understood.

Figure 1 shows that at present the economic values being represented in the NCA for the PFE only represent the 'tip of the iceberg', particularly for the cultural values of trees and woodlands that publics have clearly identified in various studies (see Table 1). The consequences of only including a narrow range of values in decision-making is that other values can appear less important, conflicts may arise if these values are not recognised (for example protests over the 'sell off' of the PFE in England in 2011 provide evidence of the concerns that can arise when CES are not taken into account, see Kenter et al. 2014) and opportunities may be missed by managers in terms of funding and the potential to work with and engage communities.





Figure 1: Values being accounted for and not being accounted for in the National Capital Accounts for the Public Forest Estate in England



Table 1: The wide range of cultural ecosystem values for trees and woodlands from a meta-synthesis and analysis of 31 woodland focused studies (O'Brien and Morris, 2013)

ES category	Value categories	Value types				
	Health	Physical well-being				
		Mental restoration				
		Escape & freedom				
		Recreation, enjoyment & fun				
	Nature / landscape connections	Sensory stimulation				
Trees and		Nature connectedness, biodiversity				
woodland as important		Landscape improvements				
environmental spaces i.e.		Screening / Shelter				
		Gathering non timber forest products				
		Sense of place				
destination woodlands with facilities, local woods, community	Education / Learning	Personal development				
		Education / learning				
	Economy	Livelihoods				
woods, parks,		Contribution to local economy				
trees as part of green	Social Connections	Strengthening / building existing relationships				
infrastructure, copses etc.		Building new relationships				
		Participation & capacity building				
	Cultural and spiritual significance	Symbolic / Cultural / Historic				
		Sense of ownership				
		Meaning and Identity				
		Religious, spiritual, artistic inspiration				



2. Review methods

The objectives of the review were as follows:

- Identify what methods and tools are used to capture the value of cultural ecosystem services (CES) and benefits of trees, woods and forests?
- Explore what methods are used to try and integrate qualitative, quantitative and monetary values for CES and benefits and in what situations are they used?
- Identify what the existing evidence reveals about the use of these methods for studying CES and benefits i.e. what contexts are the methods being used in and are the outcomes linked to any specific decision-making process?

The following inclusion and exclusion criteria was used to ensure relevant evidence was gathered:

- English language articles only
- 2005 to present
- Only include articles that address the research questions
- Search for article title, abstract and keywords
- Include grey literature where relevant as well as academic papers
- For topic areas with large amounts of evidence use articles that are reviews of evidence or meta synthesis / meta-analysis
- Focus primarily on articles that study cultural ecosystem services.

Appendix 1 shows the search terms used in the first round of searches. Scopus, Google Scholar and Google were used to search for both academic and grey literature. These searches resulted in 292 hits of which 82 were deemed to be relevant. Further searches were made (see also Appendix 1) to explicitly cover further CES and benefits, and different valuation methods and tools. This resulted in another 299 hits of which 70 were relevant. The 152 relevant papers and reports were looked at in more detail and the selection narrowed to 53 peer-reviewed articles (including 30 empirical studies, 14 literature reviews, 9 conceptual/framework related studies) and 4 grey literature (3 reports and 1 book chapter) that met the criteria and were specifically relevant from both of the searches. Data was input into a spreadsheet for analysis and review.

3. Methods to integrate Cultural Ecosystem Services

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Trees, woods and forests deliver multiple benefits and value to society – they provide a range of ecosystem services (ES). Some ES associated with trees and woodlands are 'complementary', in the sense that they can be provided simultaneously and in combination by a given tree or woodland without trade-off or compromise. For example, an urban woodland might provide a flood control service at the same time as improving air quality for local communities. Other combinations of ES, however, may be 'incompatible', in the sense that the provision of one service can only occur at the expense of another. A good example would be a plantation woodland that is managed to maximise the production of timber, which will mean losses in terms of recreational and aesthetic value to forest users, or losses in water quality to downstream communities. In situations where ES are incompatible, woodland management will require the provision of some services to be 'traded off' or choices made to prioritised services – those managing a particular woodland or forest will have to adopt a compromise position where some ES are given priority over others.

This interplay between different ES and benefits means that analysis in support of decision-making, planning and management of trees and woodlands needs to facilitate two kinds of integration. Firstly, analysis will need to show how changes in land-use or management will impact across a range of ES, including CES, provided by a given tree, woodland or forest – analysis must provide integration between and within ES categories, so that ES 'winners' and 'losers' can be identified and choices can be made about priorities. Secondly, the analysis of ES interplay and the consequences of different management choices need to be integrated into decisions and the planning and management actions that flow from them. In this section we provide a summary of methods used to achieve these two forms of integration and, where possible, reflect on their effectiveness. As a preliminary step before either forms of integration are possible, however, the CES that are relevant to a given geographical area first need to be identified and defined. So, we start by providing a summary of methods used for CES identification and description.

3.1. Methods for identifying CES

There are a wide variety of methods used to identify CES. Due to the volume of relevant papers and reports covering this topic, we have limited our summary to review studies. There is often considerable overlap between the methods used for CES identification, and those used for the integrated analysis of CES alongside other ES categories and types. Frequently identification and integration of CES form separate steps within a broader methodological approach for a given study.



In fact, in many cases the description of the methods for the identification step is omitted, as the relevant CES have been identified as a preparatory step in order to initiate a study, either through literature searches, consultation with experts, individual stakeholders, or community groups. Figure 2 highlights the main quantitative, qualitative and monetary approaches used in the studies we reviewed. Twenty of the studies used mixed methods (examples of methods include choice experiments and focus groups; and mapping and visualisation with cost benefit analysis) and this seems to be increasingly the case for studies trying to capture the complexity of CES. Many studies used quantitative methods (examples include questionnaire surveys; and i-tree valuation), fewer studies were qualitative methods (examples include focus groups, interviews and participatory impact assessment) and fifteen were reviews or reports rather than empirical research.

Participatory GIS (Geographic Information System) methods can be effective noneconomic, qualitative tools used to visualize ES, including especially CES use across differing stakeholder groups on a regional or local scale (Darvill and Lindo, 2015). These 'are spatially explicit methods that have evolved over the past decade to identify a range of ecosystem services'. Brown and Fagerholm (2015) reviewed 'participatory GIS' (PGIS) and 'public participation GIS' (PPGIS) approaches for ecosystem services to identify current and best practice. They identified 40 peer reviewed papers that reported 32 empirical cases. The methods used in this review, demonstrate high potential for the identification of ecosystem services, especially cultural services. The technology used to map ecosystem services has involved two basic types: (1) it either uses digital mapping on a computer, especially using internet map services such as those provided by Google, or (2) hardcopy cartographical/topographical maps or aerial image maps. ES are then identified by experts, individuals or groups using a marking system (e.g. pencil, pen, stickers, beads, cubes, or discs) to highlight the occurrence and location of different ecosystem services.

What the literature in this review shows is that a wide variety of methods are being used (qualitative, quantitative and monetary) and the majority of studies were not trying to reduce values to a single metric. Many qualitative approaches are used to identify CES, and these can provide rich detail of the ways in which people engage with trees and woodlands and how they are valued. We do not provide more information on methods to identify CES (see reviews by O'Brien and Morris 2013, and Kenter et al. 2014a which outline a range of studies that identify CES and their importance to people) as the key focus of this review and report is on the integration of these values with other ES categories, and on their inclusion and integration into decision-making.





3.2. Integrated analysis of CES and other ES categories

Here we provide a summary of the methods used to assess how CES and other ES provision will change in response to changes in land-use / management / policy and, where possible, offer an assessment of their relative strengths and limitations.

Many of the bibliographic references reviewed both acknowledge the need for methods for the integration of changes to CES alongside other ES categories and the inherent



challenges facing those analysts and decision-makers who take on the task. Much of the work in this field starts from a recognition of the inadequacy of decision-making informed by purely economic forms of analysis, highlighting how they tend to narrow the field of analysis to a subset of services or benefits for which markets exist, or to which monetary values can be ascribed (e.g. Chan et al. 2012; Satz et al. 2013; Potschin & Haines-Young 2011). This narrowing of analysis (and the decisions supported by it) has particularly significant consequences for CES because many of the benefits to society included within this category (e.g. cultural connections to place, community identity, religious and spiritual significance) are not traded in the marketplace and cannot be easily monetised. As such, they tend to be omitted from analysis and decisions despite being highly valued by affected communities (see Irvine et al. 2016 for a discussion on the public forest estate 'sell off' conflict). Willingness to pay techniques are used by economists but have been widely criticised (Kenter et al. 2014). However, many authors recognise the challenges of integrating CES into analysis that supports decision-making:

"There is no easy way to deal with cultural values, pertaining to ecosystems or otherwise. This is sensitive territory, which is in part why it has been neglected in ES research for so long." (Chan et al. 2012: 755)

Satz et al. (2013) set out a number of these key challenges:

- Challenges of 'calculation' many of the services and benefits provided by ecosystems are inter-connected which can lead to double counting e.g. counting health benefits but also counting recreation which could include an element of health benefit ("multiple cultural services may simultaneously result from a single ecosystem 'input,' and conversely, some cultural services are jointly produced by more than one ecosystem 'input.");
- Some argue that (some) cultural values are incommensurable (cannot be compared) with other values, making it difficult to make choices that involve a balance of losses and gains across ES categories;
- 3. People's values are not consistent across groups of stakeholders, nor are they fixed or stable and may change over time and /or be influenced through interaction with others, with the result that deliberative forms of analysis and decision-making are vulnerable to framing effects (introduction of methodological bias), endowment effects (which privilege the status quo), and manipulation as a result of unequal power in the decision-making group.

Notwithstanding the challenges, there is recognition both of the need to address the issue of integration to avoid poor decision-making, and of the significant methodological advances that have been achieved in recent years: "...it is not uncharted territory, and it



is not a total quagmire: We can represent these values more fully and can, in so doing, greatly improve the validity and legitimacy of ES research and decision-making." (Chan et al. 2012; 755).

A number of key methodological approaches are represented in the literature. These are summarised below.

3.2.1. Deliberative¹ valuation methods

In recent years there have been developments in the field of economic valuation of ES to facilitate more satisfactory accommodation of CES, many of which lie outside the domain of conventional approaches. Environmental economists have developed a range of methods for estimating economic values for non-marketed ecosystem services such as CES. Stated preference methods, involving the elicitation of people's willingness to pay, are the most widely used, but have come in for extensive criticism. For example, Abson and Termansen (2011) report the widely held recognition of the limitations of these methods which, when applied to non-market ES such as CES, fail to reflect the values that people associate with those services. Given the issues surrounding the compatibility of CES and economic valuation, there is a strong case for developing economic valuation methods that improve the adequacy of CES representation because of the importance of valuation in informing decisions between competing alternatives. As Costanza (cited in Dendoncker et al. 2014) puts it: "we humans have to make choices and trade-offs concerning ES and this implies and requires valuation, because any choice between competing alternatives implies that the one chosen was more highly valued."

Many of the developments in economic valuation of ES to better accommodate CES, sometimes referred to as 'inclusive' valuation, involve the introduction of a deliberative dimension to the analysis. This broadens the focus of analysis for valuation beyond merely assessing a monetary value or a price and facilitating the inclusion of an estimation or appreciation of worth or meaning into decision-making.

Kenter et al. (2011), for example, present and evaluate a participatory, deliberative choice experiment approach to determine the value people placed on ecosystem services in the Solomon Islands. They note the significant influence of the deliberative process on stakeholders' willingness to pay for tropical forest ecosystem services. Pre-deliberation, stakeholders' willingness to pay for these services amounted to 30% of household income. Following deliberation, key ecosystem services effectively became priceless as participants were unwilling to trade them off in the choice experiment scenarios. For example, participant's' preferences and choices revealed that subsistence food gardens

¹ Deliberation is defined as a process by which something can be considered, evaluated or appraised (Kenter et al. 2014)



were more highly valued than cash crops, revealing that the desire for money has not yet superseded considerations for maintenance of essential cultural and provisioning ecosystem services in that part of the world. They conclude that, given the impact of deliberation and group learning on valuation outcomes, participation and deliberation should be integrated into the valuation of any complex good. This approach does not mean that everything can or will be identified as priceless, and decisions or choices can be made about management with consideration and deliberation needed before, some, decisions can be made, due to ethical and justice issues.

Bunse et al. (2015) chart the emergence of Deliberative Monetary Valuation (DMV), a methodological response to the deficiencies of monetary valuation in general and stated preference methods in particular, broadly conceptualised as the use of deliberative approaches, such as citizens' juries, to elicit monetary values for environmental impacts. Spash's (2007, p.691) definition clearly articulates the application of DMV to environmental decision-making: "the use of formal deliberation concerning an environmental impact to express value in monetary terms for policy purposes".

Bunse et al.'s (2015) review of DMV approaches in empirical studies reveals how relatively few studies address CES. The studies that do address CES cover multiple ES (provisioning, regulating and cultural) and, therefore, their results do allow integrated analysis across ES categories and could, therefore, be used as an input to decisionmaking that considers relative impacts across categories. All the papers reviewed (empirical and theoretical) agree that deliberative elements in valuation have considerable benefits for the provision of more adequate information about complex and un- familiar ecosystem services, such as CES. However, the review also highlights some significant practical challenges for DMV approaches, not least of which is the issue of the costs (time and financial) of bringing enough participants together into groups to ensure that the valuation outputs are representative. The authors conclude that, for applications where statistical representativeness is required, DMV approaches might only be appropriate for local scale problems, for which it might be possible to obtain a representative sample size. They also highlight the need for careful group facilitation to avoid the introduction of bias and sub-optimal decisions as a result of 'group think', dominant individuals, and differences between participants in terms of status and power.

Noting the on-going dominance of economic valuation and the scarcity of ES valuation studies that explicitly deal with non-monetary values, Dendoncker et al. (2014) propose a three-pillar (ecological-economic-social) valuation process, to include:

 Ecological valuation – characterise the production functions describing how ecosystems generate services, and quantify (as much as possible) the interactions among these functions;



- **Monetary valuation** as a means of comparing the cost of alternatives to improve ES provision, but recognising its limitations in terms of capturing value in a broader sense ("the price of even the simplest commodity only captures a subset of the dimensions of its importance, worth and meaning to humans");
- **Social valuation** scientists give up their role as experts and launch a dialogue among researchers, decision-makers, and citizens.

They highlight the importance both of valuing 'bundles' of ES, as opposed to valuing individual ES, to avoid prioritisation of individual services (e.g. food production) to the detriment of others (e.g. biodiversity), and of a strong 'social valuation' component to the analysis to better address the normative and instrumental complexities involved with decision-making that involves choices. Also to set up democratic decisions through deliberation by allowing actors to decide who gives up what as part of a negotiation and collective learning process:

"Because environmental resources are common and complex goods, this institutional setting should ideally favour social rationality and communicative action, warranting that a societal perspective is taken and that the procedure must be able to treat weakly comparable or incommensurable value dimensions." (p.9)

It is also important to note that not all forests, for example, deliver all ecosystem services and benefits. Although not directly treated by the authors, many of the practical challenges revealed by Bunse et al. (2015) (see above) would apply to the social valuation component of the ecological-economic-social valuation framework.

Box 1 provides a case study example involving experimental use of deliberative monetary valuation via individuals and through group based deliberation and consensus making.



Box 1: Case study – Inner Forth Deliberative Monetary Valuation

Inner Forth: Deliberative Monetary Valuation and Participatory Mapping – shared values case study

Introduction and background

The Firth of Forth in Central Scotland is the estuary of the Forth where it flows into the North Sea. This case study focused on the inner estuarine area. The area includes Site of Special Scientific Interest, Special Protection Area and Ramsar designations. In the past intertidal habitat has been lost and replaced by artificial sea-defences. The Inner Forth Futurescape and Inner Forth Landscape Initiative projects revolved around a number of proposals for coastal realignment, conservation, habitat creation, and restoration. The case study sought to provide a useful example of the assessment of community values in a local ex-ante project appraisal context.

Approach taken to identify shared values

The approach taken was experimental and included deliberative monetary valuation and participatory conceptual systems mapping. First a stakeholder analysis was undertaken, followed by a stakeholder workshop. At the workshop stakeholders from a wide range of sectors developed a conceptual system model of the Inner Forth. This was followed by nine deliberative monetary valuation (DMV) workshops involving 52 community council representatives. In the DMV workshops choice experiments (CE) were used; with participants asked to weigh and choose from different scenarios. For example a CE for a new nature conservation area included different levels of attributes for participants to consider such as water quality, recreational benefits, bird populations and cost. The CE was repeated three times with stakeholders being asked to:

- Stage 1: Complete the CE individually

- Stage 2: Discuss in a group the values for the Inner Forth and which were most important. They were then given the most important system variables identified in the first stakeholder workshop. They then undertook the CE again as individuals.

- Stage 3: Finally undertake the CE as a group and through consensus or majority vote decide on a 'fair price' for the public.

This enabled three sets of monetary values to be compared – individual pre-deliberation, individual post deliberative and deliberative group value.

Results

At the first workshop landscape quality was identified as particularly important in influencing other components of the Inner Forth system. In the first stage of the CE individuals' willingness to pay (WTP) was high with the most important attribute being prevention of species extinction. The different stages of the CE showed substantial decreases in WTP particularly in Stage 2 with the focus on deliberated individual values and Stage 3 with deliberated group value and when stakeholders considered what was a 'fair price', alongside other broader investments. Through the process the WTP became more considered and focused on priorities and issues of fairness and responsibility situated within the wider social-ecological context of the region. The systems mapping showed the potential for the proposals to improve cultural ecosystem services.

See link to a handbook for decision makers (page 43) http://sharedvaluesresearch.org/handbook/

3.2.2. Mixed (technical and deliberative) methods for integrated analysis of ES

Spatial methods for integrated analysis

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Landscape value mapping using public participation geographic information systems (PPGIS) represents another important grouping of methodological responses to the limitations of purely economic valuation of ecosystem services and the need to develop ecosystem service frameworks that engage participants in ES identification and valuation. PPGIS has particular advantages over economic valuation in terms of its ability to capture a more comprehensive picture of ecosystem values, and especially the values associated with services that tend to fall outside of the sphere of markets, such as supporting services and CES. Broadly speaking, landscape value mapping processes provide a mechanism for capturing and integrating social and ecological alongside economic values, and can provide decision-makers with valuable information on where and how the public values the various services and benefits that a given geographical area provides. It can also be used to inform planning by helping to forecast changes and societal need for ecosystem services under alternative future scenarios of demographic and land-use change (Daily 2000).

PPGIS methods can range from simple paper-based applications (participants identify attributes and locations on a paper map using markers or stickers) to more sophisticated computer-based applications (participants identify locations using digital tagging or drawing). A review and evaluation of PPGIS methods is provided by Brown et al. (2015). Brown et al. (2012) test and evaluate an internet-based approach to PPGIS, whereby residents from a case study in Grand County, Colorado, are invited to place markers on a digital base map to show where ES that they value are located. The authors suggest that PPGIS provides a useful method for identifying the location of ecosystem services, (although many of these are spatially diverse), and particularly the more intangible or abstract ecosystem services, such as CES. They conclude that PPGIS is a valuable method of creating ES maps that can be used for community discourse in a planning process and to inform environmental policy decisions regarding land use allocation tradeoffs. Another study targeting a decision-making process for a large hydroelectric dam in British Colombia's Upper Peace River Watershed used PPGIS to map cultural and provisioning ES, capturing the values of seven stakeholder groups in an area lacking data (Darvill & Lindo 2015). The results showed that for many areas in the case study, CES were deemed more important than provisioning ES, indicating that participants value the landscape for more than economic purposes and, in particular, for aesthetic and recreation values. The authors argue that the PPGIS methodology and the results of their study are particularly relevant to a 'live' planning process relating to proposals to install a hydroelectric dam within the study area, which would provide electricity direct from the Peace River, but with the trade-off of significantly altering the aesthetic and scenic values of the primary ES hotspot identified in the study.



Multi-dimensional and deliberative approaches for integrated analysis

A number of the studies reviewed highlight the need for decision-making in the context of environmental management and planning to accommodate socio-cultural alongside economic and environmental considerations – the need, in other words, to base decision-making on multiple dimensions of value. Many also acknowledge the inherent complexity of decision-making which requires a balance to be struck between a number of heterogeneous and often conflicting dimensions of value represented by different stakeholder groups who may win or lose, depending on the outcome of the decisionmaking process. These combined issues of multiple and sometimes competing values, interests, stakes and stakeholders, and the need to accommodate this complexity in the analysis that supports decision-making, has resulted in the development of deliberative, multi-criteria analysis as an important category of methodological response to the need for integrated analysis of ES.

With a focus on integrated analysis in support of decision-making for landscape-scale projects, Miccoli et al. (2014) call for the analysis of multiple dimensions. Whilst they do not make explicit references to ES, they do call for integrated analysis across "technical, functional, environmental, social, economic, procedural, and historical-cultural" dimensions through the application of multi-criteria analysis. They also favour a strong participatory ethical dimension to the analysis, highlighting the need for 'social evaluation', whereby different options and scenarios are assessed from the perspective of the individuals and communities affected by the impacts of a given project.

Chan et al. (2012) also target both instrumental and ethical imperatives for integrated analysis, highlighting the need for more integration of cultural dimensions alongside other ES, and a more 'socially acceptable' form of analysis which enables the values of affected communities to be addressed. In terms of the former, they advocate a 'socioecological systems' approach, and set out a series of stages of work (a "framework") that might enable the better reflection of CES in the broader ES context. The framework consists of the following stages:

- 1. **Obtain consent** Identifying and measuring intangible values requires that those with stakes in the decision context participate as collaborators throughout.
- 2. Determine the decision context Making explicit a number of questions and arriving at a common understanding with stakeholders involved: What is the nature of the decision being made? Who is or will be making the decision and why? What is the range of possible alternatives (and what is not negotiable)? And what decision-making processes does this entail?



- 3. **Determine the socioecological context** This step includes setting boundaries of all kinds and characterizing two dimensions of the context—the biophysical dimension (e.g., abiotic conditions, characteristics of the biota, interactions among them) and the social dimension (e.g., social, economic, political, cultural characteristics).
- 4. **Determine the ES, benefits, and values** Brainstorm and broadly explore the range of ES and any associated benefits and values that may be subject to change in the scenarios under consideration.
- 5. **Influence diagrams and scenarios** Synthesize the above information in preliminary diagrams to highlight connections among the decision-making process; the key components, constituents, or processes of the socioecological system; ES provision; and the wide range of intangible values potentially associated with such services.

With respect to the ethical imperative, they recommend an approach of iteratively involving local experts and then other stakeholders while gradually defining the study on the basis of researcher and stakeholder needs or limitations.

Morris et al. (2011) present a Framework for Participatory Impact Assessment (FoPIA) for application within sustainability impact assessment of European land-use policies. The FoPIA is a structured set of sequenced research methods that, collectively, facilitate the involvement of national, regional and local stakeholders in assessments of European land use policy impacts at a case study level. The FoPIA is designed to help delivery against European Commission commitments to increase participation in policy-making in general and sustainability impact assessment in particular. Also, to enhance the guality, accuracy, credibility and legitimacy of impact assessments by involving stakeholders in the analysis of regional and local impacts of changes in land-use resulting from policy change. Integration across ES is achieved through the analysis of changes to 'Land Use Function Criteria' (LUFC) and associated indicators (LUFCI), which correspond closely to the four ES categories. A key analytical process involves the convening of stakeholder workshops to perform impact assessments for a number of alternative policy scenarios. During these workshops participants consider the relationships between environmental, economic, and social factors (represented by LUFC and LUFCI) in order to assess policy impacts accurately and to inform decisions about unavoidable trade-offs, compromises and possible win-win situations (see Box 2).



Box 2: Case study – Framework for participatory impact assessment

Land-use change in Malta – the FoPIA approach

Introduction and background

The SENSOR project, an Integrated Project funded under the European Commission's sixth Framework Programme, developed methods to improve sustainability impact assessment (SIA) of European land-use policies. One of the methods developed was the FoPIA (Framework for Participatory Impact Assessment), which was used across a number of the projects case study regions to conduct and test SIAs on two key land use policy areas (biodiversity in Western Estonia and Malta, and bioenergy in Silesia (Poland), Lusatia (Germany) and the High Tatras (Slovakia)).

Approach taken to integrate CES alongside other ES categories

Using the FoPIA approach to conduct an SIA of biodiversity policy in Malta, involved two phases of research: (1) The definition of key sustainability issues and biodiversity policy scenarios for Malta, through semi-structured interviews with 32 individuals from a range of public institutions, political parties, trade unions, universities, businesses, and business associations; (2) A SIA workshop to define and analyse sustainability criteria, indicators, and to conduct SIAs for three biodiversity policy scenarios (low, medium and high protection). CES were represented by a number of mainly social criteria and indicators (Cultural heritage and national identity value, Physical and mental well-being, Employment generation). Integration was achieved by assessing how each biodiversity policy scenario would impact on social, environmental and economic indicators (Environmental: Water status, Biodiversity, Environmental quality. Economic: Housing and workplace provision, Competitiveness and productivity, Transport provision and access). Assessment involved individuals scoring indicators using a scale of -3 to +3 for each policy scenario, followed by a moderated group discussion to agree a final impact score for each indicator under each scenario.

Results

The results of the SIA workshop show that, in terms of cultural (mainly social indicators), supporting and regulating services, the high biodiversity protection scenario was predicted to have positive impacts (mean impact scores ranging from +1.4 to +3 for the social and environmental indicators listed above). However, under a high protection scenario these positive impacts could only happen at the expense of Housing and workplace provision (economic indicator). Interestingly, however, the overall impact on the Maltese economy was considered to be positive because of benefits to tourism, a high value economic sector for the island.

For more information on the FoPIA, see Morris et al. 2011



Derak and Cortina (2014) report on the use of multi-criteria analysis involving stakeholders from a semi-arid area in south-eastern Spain to compare the impacts of afforestation with comparable unrestored landscape units. Their integrated analysis across ES categories reveals stakeholders' preferences for habitats that function best in terms of regulating and supporting services and biodiversity, and shows that afforested (pine) plantations performed best in terms of overall ES provision. However, whilst afforestation was perceived to have positive impacts on hydrological and climatic regulation, and aesthetic value, these gains were at the expense of provisioning services (forage productivity), water availability, and habitat for game species. In addition to the benefits, in terms of integrated analysis, allowing comparisons between habitat and land-use types that allowed managers to check the overall impact of their restoration programmes. The authors highlight other important positive outcomes, such as reciprocal learning through stakeholders engaged in the research exchanging information on restoration programmes and management alternatives.

3.3. Integration of ES (including CES) within decisionmaking

Broadly speaking, the literature reviewed for this section falls into one of two categories. Firstly, there are two important 'How to' reports which directly address the issue of the integration of ES into decision-making. The key insights from these documents are summarised in sub-section 3.3.1. Secondly, there are the much more numerous academic research papers reporting the application of a particular approach to the integrated analysis of ES in particular case study locations, some of which report outcomes in terms of integration into decision-making. The vast majority of references within this second category go little further than offering reflections on the value of integrated analysis to decision-making and discussing some key strengths and weaknesses of the presented approach in this regard, but provide scant detail in terms of the actual procedures and mechanisms for integration into decision-making. The key insights from these documents are summarised in sub-section 3.3.2.

3.3.1. Guides and 'How to' resources:

Perhaps the most relevant resource for thinking about how to integrate the analysis of ES into decision-making is provided by Fish et al. (2011). They focus on the role of participatory and deliberative techniques (PDTs) with the Ecosystems Approach (EsA)². PDTs are defined as "*the tools available to unlock stakeholder values, experiences and insights about the management of ecosystem services across the whole decision-making cycle."* EsA was first developed as part of the Convention on Biodiversity and represents a strategy (enshrined in 12 principles) that, through the idea of ecosystem services,

² The ecosystem approach is a strategy for integrated management of land, water and living resources that promotes conservation and sustainable use in an equitable way (CBD, undated).



recognises the importance of the natural environment to wider human well-being. In 2007 Defra published an Action Plan for embedding an EsA into decision-making (Defra 2007). The authors provide a summary of key considerations to guide the application of PDTs within the context of EsA. They start by depicting an idealised model of decision-making (see Figure 3) as a cyclical process, and illustrate EsA-relevant questions that might be addressed at each stage. This provides the basis for illustrating how, at each step in the decision-making process, the relevant questions can be addressed through a stakeholder engagement process involving the application of a PDTs. They provide an overview of key techniques and their applicability to a range of decision-making contexts, but argue that there is a unifying logic represented by 6 key steps that inform the design of any particular approach (pp.10-11):

1. **Assess what level of engagement is required.** Participation is a way of engaging decision-makers, and approaches vary. It is important to consider distinctions between wishing to inform, learn from or collaborate with stakeholders and to evaluate what is appropriate in particular contexts.

2. **Understand the stakeholder landscape.** There is a need to identify and categorise the types of stakeholders to be potentially involved in the decision-making process.

3. **Identify appropriate techniques.** A range of techniques are potentially available to decision-makers. It is important to match the right technique to the purpose and to understand what it will deliver.

4. **Assess resource commitments.** What is practically achievable in a given context is hugely dependent on available resources: money, time and skills. Any engagement process and technique needs to be assessed against resource commitments.

5. **Recruit and implement.** There are a number of considerations regarding barriers to involvement that need to be overcome as well as issues of good conduct in the implementation of techniques.

6. **Evaluate the process and its outcomes.** There are different ways of evaluating the success of a participatory process. An important distinction exists between process success and outcome success.

They then set out a 'generic pathway through decision-making' (see Figure 4), in the form of a series of steps and tasks within the decision-making process, with each step represented by a question, and an indication of how PDTs may be used to address these



questions. The pathway is intended as a guide for linking the needs of an EsA to particular PDTS, rather than a prescriptive framework.

Figure 3: The decision cycle and an EsA: indicative questions (source: Fish et al. 2011)





Figure 4: PDTs and an EsA: illustrative pathway through decision-making (source: Fish et al. 2011)





Kenter et al. (2014b) start from the premise that there are important shared, plural and cultural values associated with many ES (the values that people hold, not *for* themselves, but *with* other individuals, groups and communities with whom they live and



share experiences – often called 'shared values'), and that these values need to be captured and represented in decisions affecting the management of the natural environment, just as much as individually held values. They carried out a range of experimental case studies as part of the UK NEAFO to test out differences that arise when people are asked to consider value they themselves hold or their shared values as part of a group, community or society (see Box 1 example). They offer a handbook for decision-makers interested in the range of methods available for integrating shared values into decision-making. They provide a summary description of categories (Deliberative; Analytical-deliberative; Interpretive potentially deliberative; Interpretive; Psychometric deliberative; Psychometric) and types of method for capturing and representing shared values and, for each type, an indication of the type of shared value that may be elicited.

The majority of the methods included in the handbook exhibit a strong deliberative dimension, and the concept of deliberation and its instrumental role in supporting the accurate representation of shared values, along with the strong ethical imperatives for deliberation, are discussed at some length. There are illustrations of how deliberation may be used at various points in the decision-making process (p.24, also summarised in Figure 5), along with a broad categorisation of the mechanisms available for facilitating deliberation (categories are: Opening up dialogue and gathering information; Exploring issues in greater depth; Closing down options and deciding on actions). The work provides a strong argument for focusing on shared values for complex issues that involve ethical elements.

The Ecosystems Knowledge Network with Oxford University has recently developed a Tool Assessor as an online resource that provides information about tools that can be used to analyse the environment and its diverse benefits and includes methods mentioned in this review such as participatory GIS and i-Tree (http://ecosystemsknowledge.net/resources/tools/tool-assessor). The focus is on providing information to managers and decision makers on what tools are available and what needs the tools could potentially meet.



Stage of policy cycle	Potential tools/methods			
Ideas	Visioning Storytelling			
Survey	Deliberative monetary valuation Participatory mapping/GIS Psychometric subjective wellbeing indicators Psychological values and beliefs surveys Values compass (Social) media analysis Desk-based cultural history study Storytelling Interviews In-depth discussion groups Deliberative opinion polls Review landscape character descriptions Existing quantitative datasets			
Assess	Deliberative monetary valuation Deliberative multi-criteria analysis Citizens' juries Participatory (systems) modelling SWOT analysis			
Plan	Interviews In-depth discussion groups Deliberative opinion polls Review landscape character descriptions Existing quantitative datasets			
Deliver / manage	In-depth discussion groups Participatory mapping/GIS Participatory budgeting SWOT analysis Review landscape character descriptions			
Evaluate	As under 'Assess'			

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3.3.2. Research articles and case studies

Twenty eight of the studies reviewed made some reference to the application of analysis within decision-making. However, the majority fall short of substantiating claims, or providing any detailed description of processes for integration into decision-making process. Instead, most studies refer to information and data that could feed into decision-making processes or could be taken into account of by decision-makers.



Amongst the references reviewed for this report, there are a few studies that do make reference to specific decision-making contexts. Darvil and Lindo (2015) demonstrate an ES (including CES) visualisation tool that was used during a decision-making process for a large hydroelectric dam in British Colombia. Chan et al. (2012) describe a 'socioecological systems' approach, and set out a series of stages of work (a "framework") to improve the integration of the analysis of changes to CES and other ES resulting from decisions affecting land-use decisions. Their framework involves a number of steps (p.748), including 'Influence diagrams and scenarios', whereby stakeholders are involved in the analysis of how ES might be affected by land-use decisions and the resulting direct and indirect changes in ecosystems. However, no detail relating to the actual process of stakeholder involvement is provided.

Morris et al. (2011) go further in their description of the Framework for Participatory Impact Assessment and, in particular, their description of stakeholder workshops to perform impact assessments for a number of alternative policy scenarios. During these workshops participants consider the relationships between ES (represented by land use function criteria and LUFC indicators) in order to assess and, ultimately, to inform the selection from a number of land-use policy scenarios informed by the analysis of unavoidable trade-offs, compromises and possible win-win situations implied by each scenario.

Perhaps the most comprehensive and detailed account of integrating ES analysis into decision-making 'on the ground' is provided by Waters et al. (2012) with their presentation of Natural England's three upland ecosystem services pilot projects (Bassenthwaite, South Pennines and South West Uplands). The pilots shared a number of core approaches to realising an ecosystems approach to local planning and delivery, including:

- **Involving people** The pilot projects undertook a participatory approach to decision-making through working with partners, wider stakeholders, local communities, farmers and other land manager to address trade-offs and conflict.
- Assessing ecosystem service provision Each pilot produced a map-based assessment of current ecosystem service provision, providing a baseline against which to compare future changes under different management scenarios.
- Implementing delivery Maps were used to inform decisions on land management, resulting in map-based integrated delivery plans that detailed key actions to enhance the delivery of ES. For example, on Dartmoor the delivery plan resulted in Dartmoor Farming Futures, a farmer-led agri-environment scheme, to enhance a suite of ecosystem services and public benefits.

4. Whose values are being taken into account?

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Kenner (2014) explores the issue of who should value nature or identify the benefits gained from it; positing the question should it be companies, governments, accountants, stakeholders or communities? He also illustrates the arguments and critiques around monetary valuation outlining that many talk about the intrinsic value of nature and voice concerns that focusing on monetary values will leave nature at the mercy of market forces; something that can be traded and speculated on. A lot of these debates about value leave out the question of who should or could be doing the valuing or identification of the benefits of ES. However, the Convention on Biological Diversity (CBD, undated), mentioned in Section 3, has developed 12 principles for taking an ecosystem approach and these illustrate that indigenous groups and communities are important stakeholders and their interests should be recognised (Principle 1). Principle 11 states that the EsA should consider all relevant forms of information including scientific, indigenous, and local knowledge. This should include information about what is important to stakeholders, and local communities about nature in the areas they live and work.

Nearly one third of the studies in this review collected data directly from a range of respondents and in relation to a wide variety of contexts. The other studies involved reviewing literature or carrying out case studies, but were not directly collecting data from specific groups of people. The different groups of people in this review whose values were being sought can be grouped into:

- Users / visitors of a particular park, area. e.g. mountain biker riders in Sydney (e.g. Wolf et al. 2015)
- Residents / households who live near to a particular area e.g. residents asked about place attachment in Victoria (e.g. Brown and Raymond, 2007)
- Stakeholder groups including officials of government bodies, NGO's, private organisations e.g. land managers and owners responsible for deer management (e.g. Austin et al. 2014)
- Land / water managers including famers, forest managers, fishing and fisheries e.g subsistence farmers in the Solomon Islands (e.g. Kenter et al. 2011)
- Experts e.g. land use planning experts in Italy (e.g. Fontana et al. 2013).

It is important for forestry policy makers and practitioners to have an understanding of the social impacts of forestry policies and understand how they are likely to be perceived by different sections of society. Gaining a clear understanding of the value of trees and woodlands in particular places might help to avoid risks of public and stakeholder outcries or provide opportunities to engage more people with their local tree and woodland resource, which in turn might lead to people getting involved in caring for the resource. Section 3 outlines the importance of understanding the stakeholder landscape and involving people in the identification and integration of ES into decision-making.

5. Discussion - Opportunities and challenges

This review has sought to identify methods for integrating analyses of CES alongside other ES categories and to explore how the results of analysis can be used to inform and influence decision-making. The review outlines the many critiques of focusing solely on values that can be monetised and the resulting conflicts/protests, or lack of acknowledgement of specific ES values that go unrecognised if this approach is taken. We have also found that the literature in the area of ES is fast paced and changing with new terminology, frameworks and conceptualisations being published regularly. This can lead to a lack of clarity, misunderstandings about definitions, and different terms being used interchangeably and inconsistently; all of this can create confusion. There has been an increasing focus in the past five or more years on CES as there have been widespread concerns that values for different CES have been left out and not captured in many instances, particularly when these are difficult to monetise or quantify. Our review shows that a wide variety of methodologies have and are being used to identify CES and give them recognition, however, this does not necessarily mean that they are taken note of by decision-makers.

Current evidence shows that a range of newer techniques are being used including deliberative monetary valuation and multi-criteria decision analysis, and 'how to guides' are providing step by step approaches of how these can be undertaken; and this can inform institutional and decision-maker practices. What these new techniques illustrate is that a strong deliberative component is often needed to identify the value of CES and other ES particularly in the context of complex management and decision-making. The techniques, that include deliberation, are better able to address:

- ethical issues and concerns about the implicit commodification of ES (Gould et al. 2014),
- take account of local community values through deep exploration of attachment to place,
- can include less tangible values that people may find difficult to express without time allocated to discussion and communication-based approaches to analysis (Chan et al. 2012).

Including a deliberative component means that a wider range of data types can be accommodated within the analysis than is the case with conventional quantitative and economic forms of analysis. Qualitative, quantitative, monetary, and spatial data can all



be part of the 'currency' of deliberative approaches. This data may already exist for some ES connected to a specific place or primary data may need to be gathered to provide a more complete picture of ES.

Deliberation, as with any method of evidence gathering and analysis is not without its costs, however practitioners will need to consider the costs resulting from incomplete and partial representation of the values associated with ecosystems. Conflicts or protests from communities and stakeholders may arise, if people feel that their values are not being recognised or given adequate representation in decision-making.

The review shows that a combination of deliberative and analytical deliberative approaches can be successful in allowing CES to be considered holistically (i.e. including the full range of values not only those that can be quantified or monetised) alongside other ES (Kenter et al. 2014). These approaches can be tools for learning and negotiation (Derak and Cortina, 2014). Recent work on the idea of shared values i.e. those values held by groups, communities, and society provide opportunities for these new methodological approaches to enable people to think not as individuals but as citizens and consider what are the values of ES to society or a specific community. Evidence from this review illustrates that this type of approach enables participants to move beyond what is important to them individually to consider the wider socio-ecological context, which is important when considering complex issues.

New networks such as the Ecosystems Knowledge Network

(<u>http://ecosystemsknowledge.net/</u>) and the Ecosystem Services Community in Scotland (ESCom) (<u>http://escom.scot/</u>) are useful sources of resources, and organisers of workshops that raise debate, provide guidance and practical case studies that can aid practitioners, and stakeholders. These networks can help practitioners move beyond a focus on the value of ES to consider choices and priorities in decision-making.

As mentioned in this report there is a lot of existing evidence and knowledge of the value of ES, in fact the UK NEAFO outlined that 'we have sufficient understanding to manage our ecosystems more sustainably and good evidence of the social benefits that would arise from doing so' (UK NEA, 2014; 14). The implication for why ES are undervalued (UK NEA, 2014) therefore is attributed to a range of institutional, individual, and wider social and political barriers and challenges (Turnpenny et al. undated). These include difficulties in understanding systems thinking and dealing with complexity, fragmented working across organisations and institutions, and wider political priorities that may not align with ES protection. Turnpenny et al. (undated) highlight that there are solutions that can help to overcome some of these challenges, such as simplifying the language of ES (acknowledging that it is terminology that many practitioners do not use) and tailoring it to the needs of different audiences, shaping institutions to better engage with the value of ES, the EsA, ES delivery and ES based thinking, and encouraging partnerships between a range of government and non-governmental bodies to promote consideration of ES in decision-making.



Organisations that come together and use some of the deliberative integrative methods outlined in this review can establish important opportunities for evidence gathering on the value of ES to be integrated into specific decision contexts and capture the full range of CES, whether this is related to decisions of where to create new woodland, to develop business and housing infrastructure, expand existing woodland or integrate trees into the urban environment.

6. Conclusion

There is currently a large amount of evidence and debate concerning CES and how the value of these services can be identified and integrated into valuations of wider ES. This review has been undertaken as part of a wider programme of work which is focused on valuing and governing forest ecosystem services (see webpage for more information http://www.forestry.gov.uk/forestry/BEEH-ABTKLB). The next step in this research is to consider the implications of the review by working with a 'live' case study in which organisation/s are grappling with a specific decision context. In this way an integrative approach can be tried, tested and reported on to further our understanding, and test and refine some of the concepts and approaches set out in this review. There is a recognition within the literature that there will be no single 'one-size-fits-all' approach to take, however, the principles, pointers and references to further resources outlined in this review identify approaches for policy makers and practitioners to consider when trying to take account of CES with other ES, and in using this knowledge to make decisions.



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Appendix 1

Indicative terms and key words used for database searches (first approach taken)

Method*, OR	AND	Quantitative,	AND	Cultural	AND	Ecosystem services,
methodology*,		Qualitative,		ecosystem	NOT	Ecosystem service
OR		monetary*		services,		indicators
integrative*		OR economic		Cultural		
integration				ecosystem		
method,				benefits,		
Valuation				Benefits,		
tools,				Values,		
evaluation,				CES indicators		

Indicative search terms and key words (second approach taken)

CAVAT	AN	Deliberative	AND	Visual amenity,	AND	Ecosystem
GI evaluation		monetary		Recreation,	NOT	services,
tool		valuation,		heritage,		Ecosystem
I-tree		Participatory		Health,		service indicators
Participatory GIS		deliberation,		Nature		
Participatory		Multi-criteria		connection,		
methods		analysis,		Education,		
		Analytical-		Learning		
		deliberative		Social connection,		
				Cultural value,		
				symbolic,		
				spiritual		



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