Valuation Tools

Literature Review

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).

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). 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.

Dimensions of Valuation Tools and their Application

Monetary valuation tools reveal values given in Sterling pound; 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; 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. 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.

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: 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.

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).

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).

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.[1] 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'.

Discounting

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.

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

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

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.