

Table S1. Corpus of Valuation Methodologies, adapted from [4,5,41,46,47,60,73,126]

Valuation Approach	Valuation Methodology	Advantages and Disadvantages of Valuation Techniques
Market Cost	<i>Avoided Cost:</i> ES valued on the basis of costs avoided i.e. prohibiting the degradation or damage of environmental benefits	Mismatches can arise between the likely benefits of intervention compared to original benefits leading to misleading WTP results. Applies the precautionary principle. Can estimate indirect-use benefits
	<i>Replacement Cost:</i> valuation is based on the cost of replacing lost natural system services with artificial substitutes	Risk of over-estimation, and cannot estimate non-use values. Few available studies to verify the validity of the approach. On the other hand, it is useful for the estimation of indirect use benefits in the absence of available ecological data
	<i>Production Function:</i> value of ecological function with regards to economic output effects (i.e. productivity) or enhancement of income. Changes in ES quality and quantity on human-wellbeing	Not able to assess non-use values. Difficult to derive data about changes in ES. Widely employed in the contexts of coastal and wetland ecosystems
Market Price	<i>Market:</i> based on Willingness to Pay (WTP). Frequently used for provisioning services.	Requires market data (questionable reliability), and policies may distort market prices. However, market prices reflect personal WTP and market price data is relatively easy to obtain.
Revealed Preference (observations of individual choices in current markets related to the ES that is the subject of valuation)	<i>Travel Cost:</i> survey method valuing site-based facilities. WTP for environmental benefits at particular locations	The method is data intensive, it does not estimate non-use values and complex journeys are problematical. However, it is widely used and used in developing countries for assessing ecotourism
	<i>Hedonic Pricing:</i> valuations based on implied WTP via purchases in related markets – mainly labour and property	The method is data intensive, it does not estimate non-use values, and income-level restricts choices whilst surrogate markets must be a good reflection of values. However it can value the impact of some ES on land values
Stated Preference (survey-based presenting hypothetical scenarios asking participants to place a monetary value on the achievement or acceptance of environmental change)	<i>Contingent Valuation:</i> WTP or willingness to accept (WTA) compensation for alterations in ES. Respondents can name an amount they would pay (classical CV), or are asked to say whether they would pay a specific amount (di/polychotomous choice) or select an amount from several options (Choice Modelling).	<i>Contingent Valuation:</i> suffers from several sources of bias, inconsistent preferences, is costly and labour intensive to develop and can miss non-trivial information. However, it is able to estimate option and existence values.
	<i>Choice modelling:</i> involves more elaborate sets of scenarios (or choices) from which participant select their preferred alternatives based on a set of choice attributes. Choices constructed to reveal the marginal rate of substitution between a specific attribute and the trade-off item.	<i>Choice Modelling:</i> hypothetical bias and the choices can be complex where attribute numbers are high. However, compared to standard CV the experimenter has much more control, the statistics are more robust, attribute range is greater and the method suffers less from respondent strategic behaviour.
Value Transfer	<i>Benefit Transfer:</i> transference of values at one location (study site) to another location (policy site) of which there are four types: unit BT, adjusted BT, value function transfer and meta-analytic transfer	Large number of uncertainties not wholly accounted for between study and policy locations. Transfer of values from one context to another is difficult. Nevertheless, it is a quick and cheap method.
Participatory Valuation	<i>Deliberative monetary valuation (DMV):</i> combines states preference methods with deliberative processes from political science, involving small	<i>DMV:</i> Can elicit cultural/societal and communal contextual values. Transcendental and other-regarding values may be elicited if prompted

groups of participants in reflective iterative dialogues. May use surveys or non-econometric approaches such as citizen juries.

Deliberative Multi-criteria Analysis (DMCA): involves stakeholder groups coming together to generate formalised criteria against which to evaluate the non-monetary (as well as sometimes monetary) costs and benefits of particular management options as a platform for decision-making.

Participatory modelling: stakeholders are involved in designing and contributing to the content of analytical models that relate ES and their benefits to different spatial and temporal scenarios.

Participatory mapping/GIS: stakeholders generate physical and/or digital maps to highlight particular landscape features that they consider to be of specific value/significance or problematical in some way. Maps are usually constituted from a number of layers which can include photos, videos, drawings etc.

**Non-monetary
Deliberative
and
Participatory
Approaches**

Focus groups, Participatory Action Research (PAR), Health-based, Q-methodology: These are a set of group-based methods that are both participatory and deliberative, and seek to obtain information regarding human-nature relationships. PARs were developed specifically for use in developing countries to elicit local knowledge and enable local people to participate in decision-making. Health-based measures relate valuations to factors that affect quality of life and human-wellbeing. Q-methodology is a means of assessing the subjectivity of people's views and values.

Psychometric

Psychometric (deliberative) – *Value Compass:* this method relies on participants ranking or rating the importance of their individual transcendental values, and then discussing the degree to which these individual ratings/rankings might reflect and be of importance to the community, society and wider culture. In other words, how does one's individual value compass relate to, reflect and compare to a

through the deliberative process. Less bias, values are constructed in a social process. Inclusive of all stakeholder groups, but depending on the power-relations of stakeholders involved some value preferences may be articulated more forcefully than others. This can affect the ability of DMV to address value incommensurability and aggregation. Quite resource and time intensive as well as requiring a large sample size.

DMCA: Can elicit cultural, societal and communal contextual values, more transcendental and altruistic values are unlikely to be elicited unless prompted during the process of deliberation. Provides both individual and group values. The process of DMCA can vary in complexity and can thus require (in some cases) considerable expertise in facilitation, experimental design and statistical analysis.

Participatory modelling: Can elicit both cultural/societal and communal contextual values. The structured process has the potential to restrict the values elicited, more altruistic and transcendental values may be revealed via additional deliberative exercises. Values produced reflect the relative importance of the parameters identified and their relationship to and with each other

Participatory mapping/GIS: In particular, this process elicits communal contextual values. If the particular landscape features identified have wider significance then the process may also generate cultural/societal values. The group-based approach means that the features identified as important need not be made commensurable across a single metric or aggregated through an arithmetic process. Resources required are scalar dependent, but a level of expertise in GIS is necessary.

Overall, able to provide values regarding biodiversity, provisioning, regulating and cultural services, and they enrich the qualitative components of value. Although they require literate participants, new data collection, trained individuals and can be affected by local nuances. Protocols can be adjusted to illiterate individuals; values can be aggregated to the scale required and in some cases they can be relatively straightforward to undertake. Engage a wide-range of stakeholders and are conveyable to policy makers.

Value Compass: Can elicit transcendental, individual, communal as well as cultural/societal values. The values generated are considered separately and compared but not aggregated.

more 'society-wide' value compass.

Subjective wellbeing indicators: useful for assessing how specific places contribute to individual wellbeing. Uses a quantitative non-monetary metric.

Subjective wellbeing indicator: Can elicit communal, societal and cultural values. Values provided can be considered separately or averaged and aggregated.
