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# Five steps towards transformative valuation of nature

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The Values Assessment (VA) of the Intergovernmental Science-Policy Platform on Biodiversity and Ecosystem Services shows that while a wide range of valuation methods exist to include nature's values in diverse decision-making contexts, uptake of these methods remains limited. Building on the VA, this paper reviews five critical steps in the evaluation of project or policy proposals that can improve the inclusion of nature's values in decisions. Furthermore, improving valuation practice requires guidelines that utilise quality criteria for valuation of nature and ensure a balance between them. This paper proposes three such quality criteria: relevance, robustness and resource efficiency. The paper argues that the five steps and three Rs can generate a practical checklist to support commissioning, evaluation and performance of more plural valuations. Such guidelines can provide the next steps needed to improve uptake of nature valuation in decision-making.

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Transformative change towards a more sustainable and just future relies on a combination of actions that target leverage points centred around values, in particular (i) undertaking valuation that recognises the diverse values of nature; (ii) embedding valuation into decision-making; (iii) reforming policies and regulations to internalise nature's values; (iv) shifting the underlying societal norms and goals [20]. Valuation is therefore an important process to ensure that decisions impacting nature, and in turn the people valuing nature, reflect what is important for nature and for people,

particularly those that are most affected by the decisions [21]. Understanding the various ways that people hold values of nature (see [23]) is a prerequisite for meaningful valuation. The process by which valuation has been informing decisions has been criticised and valuation has been described as alienating, demoralising [29], costly [30] and biased, in terms of which and whose values they represent [28]. Furthermore, a recent global review of valuation studies found that less than 1% of the studies reviewed (N = 1900) reported to have been informing actual decisions [5]. Thus, most valuation evidence is derived from processes conducted without a real decision-making role. The mechanisms that may enable uptake of valuation in real decision-making are therefore poorly understood [5]. Furthermore, decision support frameworks to evaluate impacts on nature are often not suited to account for the diverse values that people hold for nature. Unsurprisingly, this has tended to focus valuation on values for which most decision support frameworks have been developed, that is, emphasis on non-market instrumental values [36,15]. It has been argued that participation of key stakeholders in the valuation process could increase the likelihood of uptake of diverse values into decision-making [5]. However, stakeholder participation is not a panacea in all decision-making contexts. In an era of rapid global change and biodiversity loss, a set of agreed-upon guidelines are urgently needed on how to undertake valuation that effectively includes the plural values of diverse stakeholders for different decision-making purposes [36].

This paper has two main objectives. The first is to propose a five-step guidance for the inclusion of diverse values of nature in decision-making based on the perceived gaps in existing valuation procedures. The proposal for a 5-step guideline is based on an elaboration of Values Assessment (VA) valuation step model [36]. The second is to highlight key criteria that can be used to inform valuation choices at each of the steps. We start out by defining the meaning of valuation for the purpose of this paper and outline some of the existing stepwise procedures that have been used to organise the evaluation of projects and policies impacting nature and people. This highlights the emphasis that has been given to different challenges for inclusion of diverse values of nature in decision-making and allows us to discuss the perceived gap in existing evaluation procedures. We then propose three policy-relevant criteria that can be used to guide valuation choices. We illustrate these criteria in a five-step procedure that we argue can inform future guidelines to account for diverse values of nature in decisions.

## What is valuation?

*Valuation of nature* is the process of documenting the existence and strengths of diverse values, either directly or indirectly, using methods and approaches that elicit and articulate values of nature [35]. Characterising which and whose values are important allows making them visible and it increases the probability of their inclusion in decision-making. Plural valuation simply means that several broad and/or specific values are considered (see [23], for further details). Two major shifts in the valuation field have been documented in the VA. First, valuation has developed from being primarily defined using monodisciplinary approaches [17], such as valuation based on welfare economic concepts of value, to also draw on a broader range of disciplines and traditions. While this is recognised in the valuation field, the explicit integration of different disciplines and traditions in pragmatic methodological considerations is lacking [15]. Second, that there are not inherently 'good' and 'bad' valuation methods. Rather, the quality of a valuation activity is — among other factors — determined by how well the valuation process matches its social–ecological and political context. Ultimately, it is how methods are applied that eventually determines the quality and usefulness of the outputs for decision-making. While this realisation is not new to valuation experts, it has not been explicitly addressed in existing stepwise descriptions of interdisciplinary valuation frameworks or procedures. As such, to 'assess' the quality of valuation for decision-making, it is necessary to explicitly account for the ultimate societal goal and surrounding political process (see also Jacobs et al., this issue).

The definition of valuation used above implies that while individuals knowingly or unknowingly engage in valuing nature to enjoy, understand and interact with nature, we use valuation to mean an activity conducted for purposes beyond those of the individual, usually for collective or societal benefits. Valuation can have many objectives such as the design of policy instruments to enhance participation of land users in conservation and sustainable management of nature [16] or improve collective understanding of socio-environmental challenges to mitigate conflicts over natural resource use [8]. To improve the clarity of our proposal, we describe the five steps and three quality criteria in the context where decision- makers adopt valuation as a means to support the choice between alternative projects or policies.

## Inclusion of values of nature in decisions — guiding procedures

It is well-recognised that the diverse values of nature are largely omitted in economic and political decision-making [14]. Cost–benefit analysis (CBA) has been a standard procedure required in many countries to evaluate the merit of, for example, large-infrastructure projects with large-scale impacts on society in terms of opportunities for economic development and adverse social and environmental impacts (e.g. UK green book [12]). The method has been used to evaluate projects or policies that involve

trade-offs between spending (or avoided costs) in the immediate future with long-term benefits (or damages) [1,22]. It uses monetary values, primarily market price (or exchange value), and provides a consistent valuation framework to evaluate projects or policies in terms of their benefits and costs (i.e. gains and losses) [6,22] to justify public (or private) investment in a given project or policy. The general steps include: 1) define the scope of the project or policy, that is, whose welfare is being impacted, what is the relevant population; 2) identify the physical impact of the project or policy; 3) value the physical impacts and aggregate them across different types of benefits and costs; 4) aggregate across time by discounting future costs and benefits; 5) evaluate the different options using the net present value test; 6) conduct sensitivity analysis and commonly the distribution of impacts across different groups [11,26]. The timing of benefits and costs occurring in the project or policy proposal is accounted for in the CBA by a discount rate that has been the subject of intense discussion for decades [4,7] and has led governments to adjust guidelines over time to better take into account long-term impacts that are often involved when impacts on nature and the environment are at stake (e.g. [12]). A major limitation of CBA in the context of plural valuation is that it cannot be effectively applied to projects or policies that have non-marketed benefits and costs (such as biodiversity or ecosystem services outcomes), which have not been measured in monetary terms [11]. Such benefits and costs are out of scope in CBA [37] and complementary qualitative descriptions of such costs and benefits have been recommended. While discounting has been widely debated, the review of valuation studies in the VA found that a large majority of valuation studies focuses on elicitation of values of people living today and do not consider long-term costs and benefits or how to account for these [36]. Moreover, the focus of CBA is primarily on maximising total net gains, rather than achieving fair or equitable distributions [4], although practical guidance sometimes calls for consideration of equity outcomes [13].

Multi-criteria decision-aid (MCDA) is often advocated as a response to the limitations of CBA and follows a less-strict framework that hence allows inclusion of more diverse types of values. MCDA also focuses on comparing alternative project or policy options with different impacts on nature as well as socio-economic impacts on different groups of people. Most MCDA processes involve three distinct steps: 1) establish a shared understanding of the decision context, and structure the valuation task by identifying and formulating alternative options and criteria to assess them; 2) conduct actual analysis that broadly involves criteria assessment, weighting, aggregation and sensitivity analysis; 3) bring together information from the previous steps to facilitate actual decision [2]. While in principle, this process is designed to include a variety of stakeholders and hence values, in practice, stakeholders are rarely engaged in identifying alternatives and formulating criteria (step 1) [2]. Another issue relates to the assumption that values are mutually exclusive in order to assign constant-sum weights (step 2), which makes the process of values mapping challenging [38]. Still in step 2, most applications pay little attention to how information about performance of each alternative is converted into a dimensionless scale of preference that is supposed to express the level of desirability of that alternative [2]. In sum, when MCDA processes are implemented, they face significant computational and cognitive limitations [38], which complicates the extent of stakeholders' inclusion. Recently, the Organisation for Economic Co-operation and Development has provided guidelines for the use of deliberative processes to include citizens to a larger extent in public policy [18]. The principles outlined in the report offer generic methodological guidance that is transferable to valuation processes.

Besides methodologically oriented guidelines for CBA, MCDA and deliberative procedures, there are also guidelines that specifically aim to include values of nature in decision-making. With the rise of the The Economics of Ecosystems and Biodiversity (TEEB) initiative [31], a concerted effort has been made to develop stepwise guidelines for inclusion of values of ecosystem services in decision-making. There have been several guidelines published in different contexts (e.g. a guideline for urban management [33], for country case studies [32] and also TEEB for Agriculture and Food [34]). TEEB takes an ecosystem-centred approach and suggests a five-step procedure: Step 1) specify and agree on the policy issue with key stakeholders; 2) identify the relevant ecosystem services; 3) define information needs and select appropriate methods to measure; 4) assess and value ecosystem services; 5) identify and appraise policy options; 6) assess distributional impacts [33]. Although this TEEB approach includes stakeholder perspectives in Step 1 through discussions about which ecosystem services are relevant to them, it is often not explicit whether and how stakeholders are engaged beyond this stage. Also, the relationship between nature and people is limited to ecosystem services. The framework does not focus on whose values the valuation refers to. Rather, the TEEB guide focuses on identifying which valuation methodologies are best suited to elicit individual NCPs (Natures Contributions to People) [10].

A key practical consideration in valuation is how to make choices that influence the quality of the valuation outputs for decision-making. This is critically important, as biased valuation outputs can potentially lead to adverse decision-making outcomes, but quality criteria are rarely explicitly addressed when commissioning studies. The Intergovernmental Science-Policy Platform on Biodiversity and Ecosystem Services VA identifies three such quality criteria — relevance (R), robustness (R) and resource efficiency (R) — collectively referred to as the

3Rs [36]. The 3Rs always interact with valuation processes, including choice and application of valuation methods and approaches. This implies that trade-offs between the 3Rs should be continuously evaluated, as valuation choices affect the balance between them. Briefly, the relevance criterion evaluates the capacity of methods to elicit the values of nature that matter to people, and their versatility in terms of adapting to different social and ecological contexts. The relevance of specific valuation methods will therefore vary according to the purpose of valuation and the socio-ecological and policy contexts. The robustness criterion refers to the ability of valuation to represent people's values of nature reliably and fairly. The resource-efficiency criterion for valuation refers to the affordability and ease of use and includes both initial ease of implementation (including technical and data sources) and ease of operation in terms of the time and financial costs once the initial capacity has been established. We argue that these key considerations need to be explicit in future valuation guidelines to improve the quality and increase the uptake of valuation in decision-making.

## The 5-step valuation framework

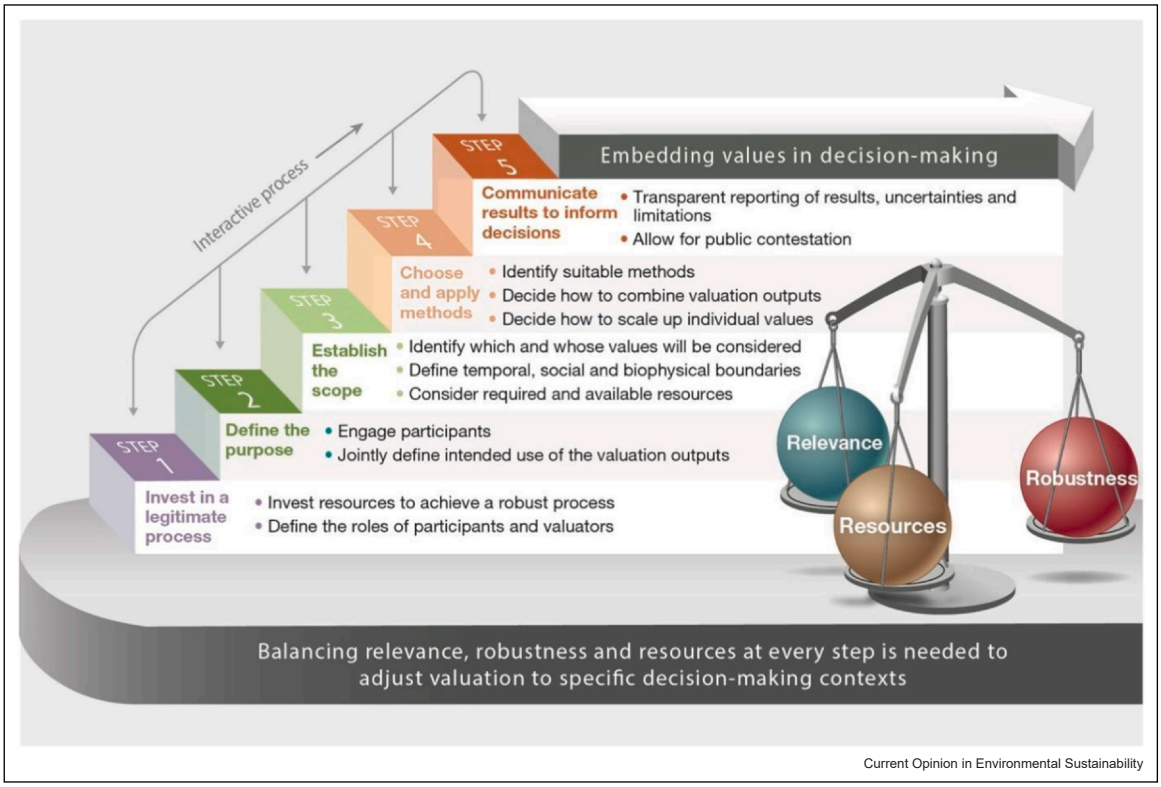
Below, we describe the proposed 5-step procedure illustrated in Figure 1.

### Step 1 Establish a legitimate valuation process

Step 1 relates mainly to relevance and robustness consideration. This step aims to ensure that the providers of valuation information are explicitly defined, and that there is transparency in the robustness of the valuation, particularly regarding representativeness and participation. This becomes particularly relevant when the project or policy impacts very diverse communities. Assessment questions to consider in step 1 are:

1. Who is dependent on the (changes in) nature considered (individuals, groups or communities)?
2. Which groups of people (and non-human beings) need to be distinguished?
3. Whose values need to be represented? and who needs to participate in the valuation process?
4. Which processes and inclusiveness measures need to be implemented?

**Figure 1**




A 5-step valuation framework to embed values in decision-making. At each step, choices need to be made considering the trade-offs in valuation regarding relevance (ensuring that different values can be considered), robustness (reliable and theoretically consistent evidence following a transparent, and socially inclusive and legitimate value elicitation process) and resource efficiency (time, financial, technical and human resources). Source: IPBES2022 [19].

Understanding and acknowledging the importance of stakeholders' and rightsholders' participation and representation can help to navigate towards better outcomes, avoiding conflicts due to the misrepresentation of values. Lack of participation and representation may also reduce the inclusion of the results into decision-making [24,25].

The participation level can be used to characterise the depth of stakeholder/rightsholder engagement and the presence of actions to remove barriers for ensuring an inclusive process. The lowest level of engagement only captures data and information, while at the highest level, stakeholders and rightsholders are actively involved in reviewing and validating the valuation outputs or processes. The representation level depicts how diverse groups are targeted and recognised in the process, as well as how the presentation of values is disaggregated for these groups (see [27]). The ultimate decision-makers have a key responsibility for ensuring the legitimacy of the valuation process. The VA revealed that the majority of valuation studies do not include any active participation of people impacted by the project or policy. Studies that do mainly limit stakeholder's role to data providers without giving them the agency to guide/influence the valuation process [9].

### Step 2 Define the purpose of valuation

Valuations are initiated (explicitly or implicitly) with certain societal goals and decision-making purposes. The VA identifies three main overarching societal goals: improved state of nature, human well-being or justice. The VA reviews showed that the most common goals of valuation are to improve the state of nature, then improved well-being and the least common goal is to enhance just outcomes [36].

The purpose is the 'way how' valuation targets a certain decision-making process, for example, by providing information on values or by designing policy instruments. If the goal and purposes are not explicitly stated at the start of valuation, it is impossible to assess which type of valuations and valuation methods would be relevant. Based on decisions in step 1, the goal and purpose of the valuation can be stated, communicated towards or deliberated together with the relevant experts, groups or communities. Transparency in this step mitigates the risk for valuation to be conducted or commissioned in ways that will result in non-useful outputs, or outcomes that further reproduce or aggravate injustices. Some important questions to specify the purpose of valuation are the following:

1. Why is the valuation considered?
2. Which decisions does the valuation aim to inform?
3. What are the constraints in current decision-making procedures impacting nature?
4. How will valuation outcomes target these decisions?
5. Who will be involved in decisions regarding these questions (adapt step 1 if necessary)?

### Step 3 Establish the scope of the valuation

Once the goal and purpose are clearly stated, a decision is needed on which values will be explored or addressed by the valuation. Together with the involved stakeholders/rightsholders and decision-makers, giving due consideration to the involvement of the groups that need to be represented, an inventory of relevant value types can be developed [3,23]. In this stage, it is possible — based on the broad and specific value types inventorised — that the scoping needs to be reformulated or broadened to include identified values.

This inventory then is confronted with the available resources and expertise. Additional valuation expertise might be needed, and resources might need to be spread across experts in order to cover the required value diversity. Resource availability might require trade-offs to be made, either on relevance (e.g. excluding certain relevant value types) or robustness (e.g. choosing a quick screening method rather than a resource-intensive one) (see step 4 below). Important guiding questions for this step are the following:

1. Which value types are needed within the scope of the valuation considered (step 1)?
2. Which value types are not relevant (enough) to the people considered (step 1)?
3. Which value types are relevant to the purpose of the valuation (step 2)?
4. What kinds of expertise are needed to conduct valuations for these value types?
5. What resources (time, financial and technical) are available?

### Step 4 Choose and apply relevant valuation methods

Once the valuation process, purpose and scope are clear, it is time to select relevant (sets of) valuation methods and apply them. This step is intertwined with the trade-off considerations regarding available resources in step 3, but also needs to take into account some inherent features of existing methods, for example, whether the method can be used for ex ante evaluations. This step requires involving open-minded experts from different disciplines to avoid disciplinary biases in choosing the valuation methods. The informed choices made in this step build on the process, purpose and scoping steps and have immediate and large implications on the valuation results. It is risky to skip these steps or leave them implicit, as the choice of method is then left to the person or group that happens to have the authority to decide, but — because of inevitable social or disciplinary bias — does not necessarily realise, recognise or represent the full extent of value diversity entailed by the purpose.

Step 4 operationalises the generalisable trade-off between the 3Rs, but also entails highly context-specific choices as existing data availability, skills and opportunities for engagement with stakeholders vary across decision-making situations. Important guiding questions for this step are the following:

1. What is the requirement for new knowledge on values?
2. How well are the policy options and their impacts understood by individual participants?
3. Are the impacts contested by stakeholders (including experts)?
4. What is the severity of poor decisions in the short and long term?
5. How reliable and replicable does value information need to be in order to be useful for decision-making?
6. Can different values be aggregated to represent a society's overall value?
7. How should the distribution of positive and negative impacts be identified?
8. How can the results address the requirements of the decision-maker?

#### Step 5 Articulate and communicate valuation outcomes to inform decisions

Valuation outcomes need to be easily communicated or presented to facilitate their inclusion into decision-making. This step not only requires effective and transparent communication, but also an honest reflection around the limitations and omissions of the valuation process. Any factor that poses risks to the uptake of valuation results should be explicitly reported. The uptake of information in decisions must be a shared responsibility among the decision-makers, actors commissioning the valuation, the valuators and the diverse actors involved in it. This goes beyond transparent communication of values and assumptions, and requires opportunities for contestation of the conclusions reached. Important guiding questions in this step include the following:

1. How can the results be used?
2. How should they not be used?
3. What uncertainties must be considered?
4. Which risks do these uncertainties entail?

Together, the 5 steps outline how nature's values can become embedded in decision-making, from choices over individual alternative projects to wider-reaching formal requirements for consideration of more types of values in policy implementation such as the initiative on nature-related financial disclosures.

## The way forward

The VA has generated renewed awareness of the need for more widespread undertaking of valuations that explicitly make visible the values at play in decision-making, and those forgotten by it. A broader and more inclusive definition of valuation, such as that proposed in the VA, calls for the development of capacity to navigate and harness the multiple tools, methods and techniques that exist to effectively apply valuations in different contexts. The 5-step approach consists of a general framework that invites reflection on the part of those who commission, design, conduct or assess valuation studies, calling for transparency that can help address the quality requirements of valuation. Requests for more plural valuation require building capacity to apply mixed-methods approaches that build on different disciplinary expertise to elicit different types of values [36]. Such training must be sensitive and realistic to the limitations of the use of multiple methods since their underlying assumption and disciplinary origin can make some methods incompatible with one another. Moreover, investment in capacities to undertake plural valuation needs to go hand-in-hand with removal of other barriers in valuations, such as access to recent and relevant information (e.g. literature and datasets that are protected by paywalls) and tools (e.g. high-cost software). Finally, since many decisions about nature take place in the territories and homelands of Indigenous Peoples and local communities, who effectively manage large parts of the worlds' biodiversity, it is paramount to develop and provide culturally appropriate methodological options for valuation.

## Conclusion

Recognising the diversity of nature's values through undertaking relevant and robust valuation and embedding values in decision-making are two fundamental values-centred leverage points that can help create the necessary conditions for activating transformative change towards more sustainable and just futures. In this transformation, it will be increasingly necessary and desirable to ensure that decisions about nature consider the multiple ways in which nature is important to a diverse set of stakeholders. Standardised and validated guidelines for ensuring this are scarce, however, and challenging to apply to different cultural and decision-making contexts. Early and continuous engagement of key stakeholders, rightsholders and decision-makers following agreed principles on transparency, representation and inclusion of affected groups and arm's-length principles to ensure the integrity of the valuation results are necessary to achieve transformative valuation. We outline a 5-step process that can form the basis for a tailored guiding framework to build capacity for nature valuation in different contexts. Responding to the series of questions put forward for each of the five steps can increase relevance, robustness and effective resource use, and as such, the quality of valuations of nature aimed at informing decisions about nature.

## Data Availability

No data were used for the research described in the article.

## Declaration of Competing Interest

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

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- •• of outstanding interest.


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