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Editorial overview: Leveraging the multiple values of nature for transformative change to just and sustainable futures — Insights from the IPBES Values Assessment

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Addressing the nature crisis requires systemic transformations in society, especially regarding what and how political and economic decisions are made, and understanding how we take everyday decisions that affect our relations towards nature. Underpinning transformational change towards more just and sustainable futures thus requires assessing the role that nature's values play in decision-making across scales and how valuation methods and approaches can best guide decisions. Given the diversity of the values of nature, it is key to map out what those values look like, and how they are formed and evolve over time in relation to institutions (i.e. society's conventions, norms and rules). This special issue draws on the IPBES Values Assessment published in 2022 and engages with key questions about the role of values and valuation of nature for transformative change towards more just and sustainable futures. The special issue presents papers that review topics about how to conceptualise value diversity and undertake valuation to guide decisions geared towards transformative change. It also focuses on how power, justice and socio-environmental conflicts intersect with nature's values, and the role of diverse values in conservation and development policy instruments.

Nature's values, transformative change and sustainability

Current policy responses to the nature crisis tend to be reactive, generally addressing negative impacts on nature once they have occurred, and incremental, taking one small step at a time. Such responses primarily focus on addressing the negative consequences of nature's diminished ability to deliver (mostly) material benefits to people [18]. Policy measures are also often based on economic and technological solutions that attempt to nudge human activities away from current deleterious practices [9,20,22]. Yet, it is increasingly recognised that in order to create the necessary conditions for society to navigate into more just and sustainable future pathways, (deep) transformative changes are required that address the root drivers of the nature crisis. This would involve system-wide reorganisations across technological, economic and social factors [27]. Such a transformative change inevitably entails focusing on key underpinning aspects of human-nature relations, such as societal goals and values [5,20].

In 2018, the Intergovernmental Science-Policy Platform on Biodiversity and Ecosystem Services (IPBES) launched a methodological assessment on the diverse values and valuation of nature (known as the Values Assessment) to explore the many ways nature is valued (and undervalued) by people and the implications of these values for decision-making about nature [3,26]. The Values Assessment was approved by the IPBES Plenary in July 2022. This approval of the assessment reflects that global science

monitoring strategies, at local to global scales.

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and policy concur (at least discursively) in terms of acknowledging that addressing the global biodiversity crisis implies confronting substantial barriers tied to powerful vested interests favouring the status quo that emphasises market values of nature. It also proclaims the need for recognising and integrating a wider diversity of values about nature into decision-making and in particular leveraging those values that are aligned with sustainability outcomes [26]. This message from the Values Assessment has influenced international agreements such as the Convention on Biological Diversity's Kunming-Montreal Global Biodiversity Framework that has called for incorporating nature's multiple values into local to global actions [8].

The Values Assessment has also shown that transformative change towards more just and sustainable futures requires the activation of a set of four values-centred leverage points (VLPs) [18]: 1) adequately recognising the values of nature by undertaking plural valuation; 2) meaningfully including the diverse values of nature into decisions, by embedding valuation into inclusive (i.e. fair and democratic) decision-making processes; 3) undertaking institutional changes based on reformulating policy and regulations to consider nature's diverse values; 4) shifting personal beliefs, values and paradigms that underpin how people relate to nature and to each other in more just and sustainable ways [18] (Figure 1).

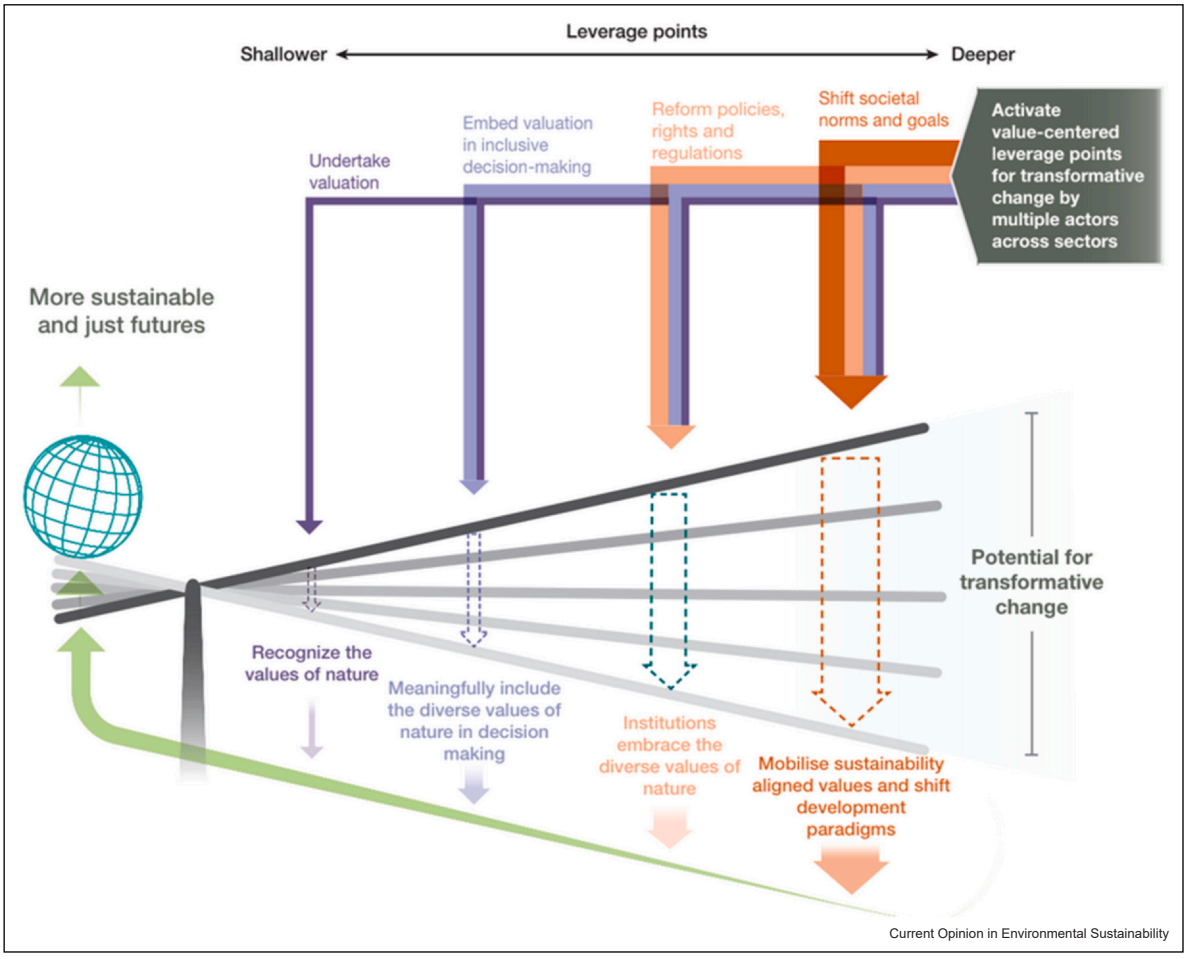
These VLPs are not independent steps but rather complementary. The specific mix of strategies to activate the leverage points would depend on the social–ecological context (e.g. what are the key features of nature, society and their current state), the institutional setup (i.e. what norms and rules underlie the decision-making arena), the actors involved (e.g. who will be affected or benefited by decisions about nature and consideration of alternative interpretations of concepts such as sustainability and justice [18].

Just activating VLPs alone would not automatically propel transformative change as this would also require other levers associated with the allocation of responsibilities (e.g. the principle of common but differentiated responsibility), and rights (e.g. property rights). However, the fundamental role of values for transformative change has not been sufficiently addressed in science and policy [18]. A focus on VLPs thus involves engaging with value plurality as well as tempering values such as individualism, consumerism and materialism, while promoting sustainability-aligned values such as stewardship and care, as well as embracing alternative (instead of non-dominant) visions of a good life [6,9,18].

The special issue wheel

This special issue includes a set of 14 papers based on in-depth reviews of different strands of the literature on the values of nature and provides evidence and novel ideas that support the importance of the four VLPs as part of broader transformative strategies needed to address the nature crisis, and each discusses how such VLPs may be activated or — how far short society is in terms of activating them. The papers rely on academic and grey literature as well as on case studies from around the world. The volume is structured into five complementary blocks, with each block exploring the fundamental role of nature's values in transformative change (Figure 2).

Figure 1



VLPs for transformative change towards sustainability and justice.
Source: Ref. [26].

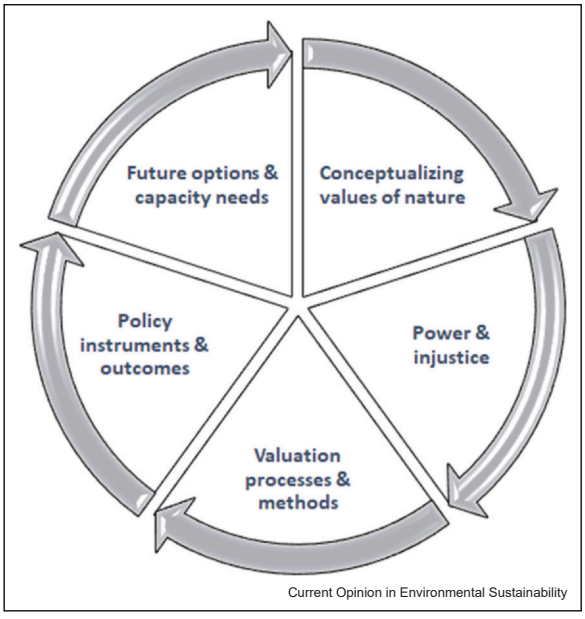
Conceptualising values of nature

The concept of value has multiple interrelated meanings and therefore it is defined differently depending on the disciplinary lens that it is applied [19]. Raymond et al. [23] present the typology of nature's values used in the Values Assessment and illustrate how it can be used as a tool to better understand how multiple value conceptualisations shape decisions about nature. They clarify how the typology helps to better understand different value expressions that coexist for a given natural entity. For example, there may be divergent (or overlapping) *specific values* (i.e. instrumental, intrinsic and relational values) of a given forest for different people. In addition, it explores the relationship between different value categories. For instance, *broad values* (i.e. life goals and guiding principles) are determined by *worldviews* (i.e. the lenses through which people perceive and interpret the world), which then are expressed contextually as *specific values*, and can be measured using *value indicators*. Also, the way these different values influence behaviour is explored. Gould et al. [10] address this issue by assessing different theories of human behaviour and explore how these theories link to values and value-related constructs, including values as principles (e.g. life goals) and values as worth (e.g. preferences, priorities). They then critically examine the notion of *value–action gap*, that is, when people's actions do not fully align with their values, and explore approaches to address this gap.

Power and (in)justice

Since values form, evolve and are expressed in conjunction with exercising 'power' (i.e. the capacity of actors to mobilise agency, resources and discourses to achieve a given goal), it is fundamental to pay attention to the interactions among values, and different forms of power as well as the multi-dimensional notion of justice. Such interactions are key in socio-environmental conflicts and

Figure 2



The wheel of the special issue and the five interacting broad topics.

thus understanding them can help identify the challenges and opportunities to manage conflicts underpinned by value clashes [18]. The companion papers by Arias-Arévalo et al. [2] and Lenzi et al. [16] focus on a values perspective on social power and justice, respectively. Arias-Arévalo et al. [2] present a typology of power relations linked to values of nature that help differentiate among two different types of power in society: discursive and structural power. They argue that addressing these dimensions of power can contribute to a VLP approach to transformative change. More specifically, *discursive power* relates to the discourses and knowledge that shape worldviews and values. Discursive power includes the power to frame or communicate issues and in turn privilege some values over others (i.e. *framing power). Structural power* highlights how historic-specific sociocultural, political and economic systems result in the prioritisation of certain values. Linked to structural power is *rule-making power* (i.e. the power to create rules, and to direct them towards certain interests and values) and *operational power* that refers to who holds formal or informal rights to nature and what and whose values are embedded within these rights structures. Lenzi et al. [16] clarify three key dimensions of justice in the context of nature's values: i) *distributive justice* related to the fair sharing of the benefits and burdens of access to nature, ii) *procedural justice* about the fairness of decision-making processes and iii) *recognition justice* linked to the acknowledgement of the different values of different actors. Their paper helps understand how promoting these different dimensions of justice as broad values can help achieve sustainability transformations. Then Ozkaynak et al. [17] focus on alternative analytical approaches to facilitate dialogue for assessing diverging worldviews and broad values that underpin socio-environmental conflicts. They assess the role of i) *consensus analysis* to assess how the ideas and values about nature are convergent or divergent; ii) *ethical analysis* to identify and socialise the moral judgements at stake in decisions; iii) *framing analysis* to dissect what is more or less important for people and to propose alternative accounts in ways that disputants can subscribe to; and iv) *worldviews assessments* to explore the different meanings and the meaning-making systems that inform how people interpret, enact and co-create reality. They point out that transforming any socio-environmental conflict, also involves addressing the power inequalities by designing institutions and fostering capacities to embed and use these approaches in policymaking. Jacobs et al. [13] add to this the risk that valuation exercises have been used — deliberately or not — as a tool for decision-making.

Valuation processes and methods

The assumption of rationality used in policy implies that decisions need adequate knowledge (e.g. based on updated empirical evidence and theories) about the diversity of values through relevant and robust valuation methods and practice tailored to any given social–ecological context [18]. However, the practice of valuation is very different according to what needs or wants are at stake. Schaafsma et al. [24] review evidence about how valuation studies have grappled with the issue of environmental justice and find that while there is no shortage of methods to account for the diversity of values, the majority of valuation studies fall short of adequately accounting for environmental justice across its three main dimensions: distributive, procedural and recognition justice, as introduced by Lenzi et al. [16]. They point out that improving valuation to enhance justice outcomes, requires paying attention to how valuation processes consider (explicitly and implicitly) whose values are represented. Termansen et al. [25] highlight the main opportunities for embedding valuation into decisions, which requires improving current valuation practice by following guidelines to address trade-offs between three valuation quality criteria: relevance, robustness and resources, the so-called *3Rs*. *Robustness* is about representing people's values of nature reliably and fairly; *relevance* refers to the capacity to visualise the diversity of values of nature that matters to people; *resources* (e.g. time, expertise and funding) are about acknowledging these are limited when undertaking valuation. They further propose a five-step

approach as a practical way to support *plural valuation* (i.e. the process that assesses the diversity of values that are attributed to nature and how these values relate to each other, and to improve the uptake of valuation in decision-making) [21,28]. However, plural valuation is not a panacea. Jacobs et al. [13] discuss the current and future challenges of applying plural valuation. They stress that valuation is inherently a political process that involves making decisions about why certain values matter and whose values should count towards decisions. This discussion thus challenges methodological valuation research efforts that mostly focus on the 'how question', and as such forego political considerations embedded in the 'why' and the choices for valuation.

Values in policy instruments

Reflecting on why and whose values matter is important for improving the ways valuation is designed and used, especially when researchers and decision-makers care about the fact that values are likely to be diverse and may compete between each other. This is typically the case when policy instruments need to be designed for biodiversity conservation at the local level. Being cognizant of the diversity of local values and the role of power relations among actors can enhance the quality of policy instruments in terms of their capacity to achieve better ecological and social outcomes [18]. Chaplin-Kramer et al. [7] review the existing evidence about the social and ecological impacts of protected areas (PAs) by noting how recognising and respecting the values of people locally lead to more positive outcomes for nature and for people. They highlight how combining i) respect for the values and knowledge about natural resource stewardship by local communities, ii) co-learning and iii) co-management is key to deliver such positive outcomes. Similarly, Bremer et al. [4] analyse different Payment for Ecosystem Services (PES) case studies implemented in diverse social–ecological contexts to evaluate i) how diverse values tend to be (or not) articulated through PES programmes; ii) what implications these inclusion or exclusion processes have for programme evolution and outcomes; iii) whether these outcomes support broader processes of transformative change. They find supportive evidence that considering local values is necessary to improve the social and environmental outcomes of PES programmes. The results of the reviews presented by Chaplin-Kramer et al. [7] and Bremer et al. [4] concur that integrating local values combined with securing decision-making capacities by local communities can strengthen the social and environmental outcomes of conservation policy instruments. In the context of 'developmental' interventions such as large dams or mines, Lele et al. [15] find that both relational and even instrumental values of (and knowledge held by) historically marginalised and ecosystem-dependent stakeholders are ignored. This happens to a great extent due to the absence of equity as broad value and procedural justice, or democracy in the institutions of decision-making.

These papers stress the key message that transformative change is about recognising and embedding diverse values in decisions, especially considering those of marginalised stakeholders, while at the same time reforming the institutional and governance models that underpin decisions that impact on people and nature, as well as their relationships.

Future options and capacity needs

It is unlikely that any transformative change will occur without reimagining the future. Scenario-building plays a key role in shaping the imagined futures and is influential in guiding policy. However, the role of values in different imaginary futures remains largely understudied [18]. Harmáčková et al. [11] assess the combinations of values that underlie different types of scenarios that are normatively described as desirable or undesirable from a justice and sustainability perspective. They find that there is a general skew of scenarios towards focusing on specific values (of nature) and that broad values are rarely accounted for. This is a blind spot for sustainability policies given the importance guiding principles that shape human-nature interactions. Interestingly, they find that global and regional sustainability scenarios tend to depict a greater diversity of specific values when compared with business as usual or further dystopian future visions, which tend to be dominated by individualistic and materialistic values towards nature and nature's contributions to people. Horcea-Milcu et al. [12] further reflect on the different ways to deliberately intervene to mobilise the transformative potential of nature's values in order to integrate such values-based interventions into pathways towards sustainability. They identify the inevitable tensions emerging from the different ways in which transformations towards sustainability are conceived, between promoting or shifting away from values that are desirable for some and less desirable for others and the level at which to intervene, be it individual, collective or societal. Lastly, Kelemen et al. [14] show optimism in that embracing a diverse values perspective to foster transformative governance is possible, as a necessary condition for rehauling decision-making processes towards sustainability and justice.

Values-centred leverage points for transformative change: main findings

Table 1 shows the 14 contributed papers to the special issue and their connections to the VLPs for transformative change. The 14 papers are grouped into five broad

Table 1

The 14 articles included in the special issue ordered by broad topics and their connection to the VLPs.

		VLP1: Recognize diverse values	**VLP2:** Include values into decisions	**VLP3:** Carry out institutional change	**VLP4:** Shift social norms & paradigms
Conceptualising values of nature	1				
	2				
Power and (in)justice	3				
	4				
	5				
Valuation processes methods	6				
	7				
	8				
Values in policy instruments	9				
	10				
	11				
Future options & capacity needs	12				
	13				
	14				

Note: Raymond et al. [23] (article #1), Gould et al. [10] (#2), Arias-Arévalo et al. [2] (#3), Lenzi et al. [16] (#4), Ozkaynak [17] (#5), Schaafsma et al. [24] (#6), Termansen et al. [25] (#7), Jacobs et al. [13] (#8), Bremer et al. [4] (#9), Chaplin-Kramer et al. [7] (#10), Lele et al. [15] (#11), Kelemen et al. [14] (#12), Horcea-Milcu et al. [12] (#13), Harmáčková et al. [11] (#14).

topics (by colour) covered in the IPBES Values Assessment. The shading indicates the emphasis on a given VLP (darker colour implying greater emphasis).

The first VLP concerns the adequate recognition of the diverse values of nature using the wide diversity of valuation methods and approaches that are currently available. In this regard, the typology of values presented by Raymond et al. [23] guides the identification of what and whose values may be under- and over-represented in decision-making, and can help conduct plural valuations of nature. In order to guide and design valuation processes, it is important to pay attention to designing more plural valuation processes that account for trade-offs across the 3Rs, that is, robustness, relevance and resources [25]. But since plural valuation is not a panacea either, it is as important to reflect about how to conduct (plural) valuation as whose values are at most need for being recognised and why so, which inevitably brings to the fore the power and political dimension of valuation [2,29], especially so in situations of current or potential socio-environmental conflicts [16,17]. Engaging in active exploration of the values that underpin how we understand the world and interact with it, is the basis for constructive dialogue, and helps overcome conflicts between advocates of different sustainability pathways and different ways to conceive what are desirable and undesirable values [12,17]. Whilst we have the conceptual and methodological elements to activate the first leverage point, it ought to be noted that this is a shallow leverage point [1], in the sense that it may be relatively easy to activate it but its impacts alone are unlikely to alter deeper structural elements underpinning key economic and political decisions affecting human-nature relations.

The second VLP involves including the diverse values of nature into actual decisions, by means of embedding valuation into inclusive decision-making processes. This entails designing valuation processes that are well-attuned to the specific social and ecological context at stake and respond to the specific needs of the different stages of the decision-making process, in ways that adequately represent the diversity of values involved. As shown by Gould et al. [10] the key to embedding values in decision-making processes lies in a better understanding of how values are linked to human behaviour change. This VLP can be activated through the design and implementation of conservation policy instruments. For example, in the case of PAs, Chaplin-Kramer et al. [7] argue that effective conservation in co-managed PAs, such as via Indigenous community-conserved areas and territories that protect stewardship values of local people and restore traditional resource governance systems, is more likely to be supported by local communities over the long term, especially when they perceive that their own livelihood interests are secured by having decision-making power over their territories. In a similar vein, Bremer et al. [4] point out that the transformative potential of PES programmes would be limited if they over-emphasise efficiency framings and lack a clear perspective on aspects around justice (as a broad value) since otherwise it can crowd out solidarity and care-based motivations towards nature protection. It is also key to incorporate the value plurality held across people and cultures to mobilise values for transformation, and allowing the diversity of values to coexist through collaborative processes that alternate between plurality and convergence towards consensus [12]. Further, strengthening bottom-up processes, for example, through deliberative fora, can be highly instrumental to reflect on general societal principles (such as well-being and fairness). This would need to account for ethical considerations relative to consequences of actions [17].

The third VLP is about fostering deeper institutional changes based on reformulating policy and regulations to consider nature's diverse values. This requires creating space to allow for the diversity of values to be expressed in decision-making by accounting for power imbalances [24,2] and fostering coherence in the implementation of policies and related decisions across various sectors, scales and jurisdictions by addressing value trade-offs. One example of catalysing this VLP is by reforming the way environmental impact assessments (EIA) are conducted as these do not adequately represent the instrumental, relational and intrinsic values held and expressed by marginalised stakeholders. This is demonstrated by Lele et al. [15] for the case of EIAs on large-infrastructure projects (e.g. hydropower dams and mines), which are part of the backbone of the dominant growth-focused extractivist development paradigm. To activate this VLP, they call for reforming the way EIAs are implemented, for instance, by improving the integration of so-far invisibilised values of marginalised stakeholders. This would require legally recognising the rights of affected communities and including marginalised stakeholders in decision-making, as well as respecting free–prior–informed consent from Indigenous communities, among other legal measures. Similarly, Chaplin-Kramer et al. [7] point out that institutional enablers such as those fostering the active involvement of local communities and diverse stakeholders in co-management schemes, demonstrably improve the effectiveness of more than 3000 PAs worldwide. Both Arias-Arévalo et al. [2] and Horcea-Milcu et al. [12] stress the need to dismantle asymmetric power relations in decision-making contexts in ways in which individual agency can be fostered to support collective action as an active ingredient of transformative change efforts. Given that transformative change will not be void of conflict situations as clashes between interests and values will likely compound, Ozkaynak et al. [17] highlight how transforming governance through long-term social change can be facilitated by a blend of tools to make visible the plurality of worldviews, and address the barriers to conflict transformation. Kelemen et al. [14] point out that transformative potential of policy instruments increases when more diverse values are addressed in their design and implementation. They also find out that weaving values into policymaking is possible at several junctures of the policy process, but that for this to occur, various types of capacities must be enhanced at all levels, both for public and private actors.

The fourth and deepest VLP deals with shifting individual and collective beliefs, values and paradigms that underpin how people relate to nature and to each other in more just and sustainable ways. This is linked to norms that shape what is considered to be just and sustainable and what kinds of futures and development pathways can be envisioned as possible and desirable. Working with values to eventually change the core goals and intent of society is ultimately necessary for the kind of profound, system-wide change that is required. One of the most profound changes required to transform current socio-economic and institutional structures involves (re)balancing power relations to ensure that once historically disenfranchised groups gain rule-making power (translated into operational power). For example, questioning the hegemonic perspectives in environmental policy regarding conceptualising human-nature relations through notions of, for example, natural capital and 'green' economy [2]. There is clearly a need for

fundamental shifts in values away from the current dominant ones that are not aligned with pathways towards sustainability. Top-down approaches to do so entail formal and informal education, and strategically communicating to promote values aligned with sustainability. These would be supported by bottom-up initiatives that engage with public deliberation and contestation at the societal level, through empowered communities and individuals capable of exercising their agency [12].

Final words

The special issue raises a basic and intuitive point, yet one that it is not yet ingrained in the policy arena: beyond calling for pluralising values and valuation in science and policy, what is most needed are concerted efforts across scales, sectors and stakeholders to foster sustainability-aligned values and dampen those that work against it. This entails simultaneously acting upon all four VLPs. This, in turn, will entail interventions aimed at the individual level, by shifting and reflecting on the way people's values affect their everyday decisions, as well as at the collective level by enabling and acting on positive shared societal values that can also allow for reimagining visions of alternative futures away from dystopian scenarios. We hope that this special issue will provide useful material for all those that are interested in propelling transformative changes to address the coupled nature and climate crisis from a values perspective. We hope the reader will be able to use this special issue as a springboard to help reformulate research avenues and identify ways to better connect knowledge to action so that the very structures (including the intertwined social institutions and values) that underpin the future of all people and nature are positively transformed.

Declaration of Competing Interest

None.

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Current Opinion in Environmental Sustainability

An inclusive typology of values for navigating transformations towards a just and sustainable future☆

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Achieving the intertwined goals of justice and sustainability requires transformative changes to meaningfully engage diverse perspectives. Therefore, scholars and policymakers need new ways of recognising and addressing nature's multiple values across cultures, disciplines and other knowledge traditions. By reviewing academic publications, policy documents and Indigenous and local community sources, we developed an inclusive typology of nature's values to clarify value concepts and guide their consideration in decisions. Through case studies, we illustrate how navigating 'horizontal' and 'vertical' interactions within and across this typology can help confront plural-value challenges, such as enhancing inclusive participation in environmental research and practice, and effective management of socio-environmental conflicts. We conclude by exploring how this typology of values can further leverage transformative change in other decision-making contexts.

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☆ Leveraging the multiple values of nature for transformative change: Insights from the IPBES *Values Assessment*.

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This review comes from a themed issue on **Values for transformative change: The IPBES approach**

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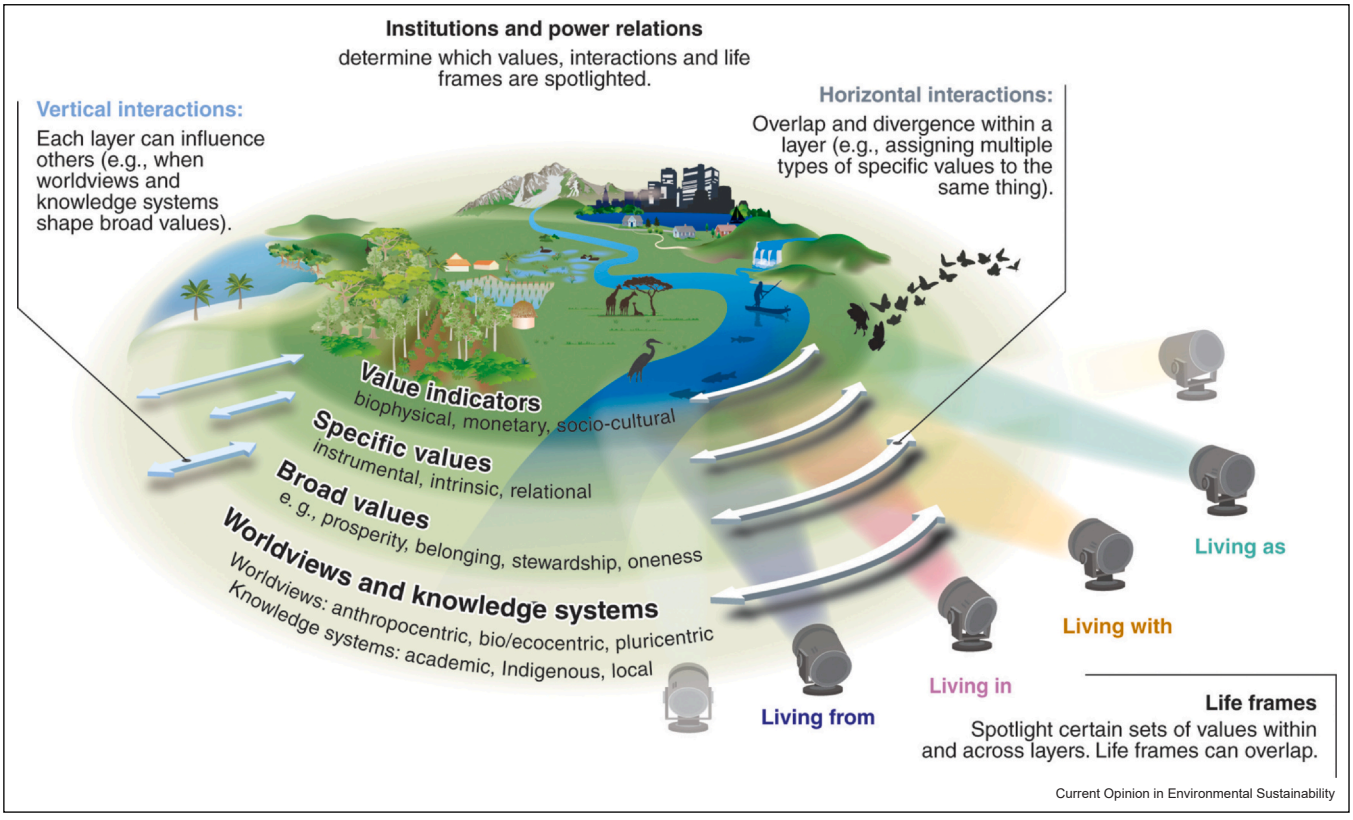
Introduction

Previous global agreements to address the environmental crisis have largely failed, partially because decisions continue to prioritise a narrow set of values of nature and nature's contributions to people [1,2]. Environmental decision-making is often discipline-specific (e.g. wilderness areas to protect biodiversity and ecosystems) or interest-based (e.g. development proposals to enhance certain sector's economic profit or growth) [3], impeding comprehensive valuations of stakeholder perspectives [4] and potentially favouring those with more discursive or structural power [5–7]. Other papers in this special issue address additional challenges related to assessment and uptake of the diverse values of nature (e.g. integration of qualitative and quantitative data) [8,9]. To overcome these challenges, transformative governance needs to be inclusive, empower marginalised communities and attend to diverse ways of knowing and relating to nature [10–12]. This is not easy; even whilst the recent Kunming–Montreal Global Biodiversity Framework (GBF) calls for fully integrating nature's multiple values into decisions [13], researchers and policymakers still lack tools to identify and incorporate them into transformation processes [11,14–16] that shift practices towards justice and sustainability [17].

As part of the *Methodological Assessment of the Diverse Values and Valuation of Nature* (hereafter, *Values Assessment*) [2], commissioned by the Intergovernmental Platform on Biodiversity and Ecosystem Services (IPBES), we reviewed academic publications, policy documents and Indigenous and local community sources regarding value concepts [4,18] to create a typology that is inclusive of many different disciplines and knowledge systems, although it cannot be comprehensive of all of epistemologies and ontologies. We focused our searches on different ways of conceptualising and classifying values. Uniquely, this typology engages values across different scholarly and management domains relevant for sustainability transformations. This cross-epistemic approach serves as a foundation for recognising and operationalising nature's multiple values in research and decision-making. We identified four key levels of meaning associated with values, constituting the typology's 'layers': worldviews and knowledge systems, broad values, specific values and value indicators. To comprehend how people prioritise values, we present the 'life frames' that relate certain value sets to different ways of being/living in the world. Furthermore, we illustrate how navigating the typology's 'horizontal' and 'vertical' interactions can help meet relevant sustainability challenges, such as achieving inclusive environmental research and practice and effective management of socio-environmental conflicts [19] (Figure 1). We conclude with recommendations for applying the typology to four leverage points of transformative change for just and sustainable futures.

Commonly, environmental scholarship and policy consider nature based on Western science's generalised definitions and notions with respect to biodiversity, ecosystems and biomes. Here, we seek to reflect more plural perspectives, including non-Western understandings, such as webs-of-life, Mother Earth or the more-than-human world. Many cultural groups, including diverse Indigenous peoples and local communities, Eastern philosophies and others, do not have an encompassing term or concept for 'nature' in general. Many groups also do not separate it as part of a human-nature dichotomy [20]. When referring to nature, therefore, we embrace diverse forms, including, for instance, 'natural' entities and features (e.g. species, communities, rivers, forests and mountains), but also interconnected 'human-nature' entities (e.g. sacred sites, human–nonhuman kinship systems, urban green/blue space and cultural landscapes). Hence, the typology helps operationalise the IPBES conceptual framework and expand the notion of nature beyond the ecological realm [21,22].

Figure 1



An inclusive typology of the diverse values of nature**.** Four conceptual value layers can be distinguished: i) worldviews and knowledge systems, ii) broad values, iii) specific values and iv) value indicators. Four non-mutually exclusive life frames are depicted here: the grey, unlabelled spotlights represent other possible framings of people–nature relationships. Different value types are exemplified within a given layer (adapted from [2]).

An inclusive typology of nature's values

The typology includes the following 'layers':

a) *Worldviews* are the 'lenses' through which individuals and groups perceive, interpret, inhabit and modify the world [23,24]. Whilst many worldviews exist, each reflecting distinct ontologies and epistemologies, here we focus on how they relate to nature and human-nature relationships. We acknowledge that perspectives with regard to nature are not independent of broader worldviews (e.g. those grounded in traditional, post-modern or contemporary spiritual understandings) [25]. Drawing on the IPBES *Values Assessment*, we focus on nature-related aspects of worldviews. The assessment showed that worldviews are strongly tied to cultural identities and different philosophies of good living, as well as different religious views and cultural practices [4]. Overall, worldviews can be clustered into three orientations regarding people–nature relationships. Anthropocentric worldviews prioritise humans [26–28]; 'strong' anthropocentrism emphasises human superiority over other species, and 'weak' anthropocentrism acknowledges human dependence upon nature [26,29]. Bio/ecocentric worldviews place importance on living beings (i.e. biocentric) or nature as a whole (i.e. ecocentric) as having inherent worth in themselves [30]. Finally, pluricentric worldviews, an emerging concept, focus on reciprocal, intertwined and embedded relationships between humans and other beings, and nature's elements and processes (i.e. with no centre) [14]. Worldviews are connected with *knowledge systems*, defined as cumulative bodies of knowledge, practices and beliefs. Knowledge systems have different classifications (e.g. academic, Indigenous and local), but all evolve by dynamic, adaptive processes, being learned or transmitted within and across generations via culture and direct experience with nature.

b) *Broad values* are life goals and guiding principles, including what constitutes desirable people–nature relationships [4]. They transcend specific contexts, but arise from particular worldviews and knowledge systems (informed by cultural settings and practices, languages and places) that affect individuals and groups [31]. Broad values encompass what are sometimes called 'principles', 'human', 'held' or 'transcendental' values [32,33].

c) *Specific values* are judgements regarding the importance of something in 'specific' contexts, including biodiversity,

ecosystems, people–nature relationships or human well-being [4]. These are sometimes called 'assigned' or 'contextual' values [3]. It is well established that specific values can be instrumental, intrinsic and relational, but in the literature, these categories sometimes have multiple, overlapping meanings (*ibid*). Instrumental values include things important as a means to an end or to satisfy preferences (usually for humans) [34]. At least in principle, they are substitutable [35]. Intrinsic values include something's worth as an end in and of itself, something's value independent of reference to people as valuers and nature's inherent moral value regardless of human importance or usefulness (i.e. right to exist) [36,37]. Relational values encapsulate meaningful relationships between people and nature and among people (including across generations) through nature [35,38]. Consequently, recent scholarship provides new 'human-nature relational models' that account for different cognitive or disciplinary frameworks of relating with nature [39].

d) *Value indicators* are quantitative measures (e.g. hectares, money and indices) or qualitative descriptors (e.g. expressions, arguments and stories) of specific values [3]. Both qualitative and quantitative indicators can be used to express and integrate different values [9]. Indicators can be categorised as biophysical, monetary or sociocultural [2]. In some typologies, health and Indigenous and local knowledge are also considered additional categories of indicators [4,21,40], but here they are recognised as cross-cutting domains.

These value 'layers' are not static; the *life frames* spotlight how different ways of being/living in the world concomitantly prioritise value sets across the typology [4,28,37,41] (Figure 1). *Living from* nature conceives nature as resources contributing to human needs and wants. *Living in* nature focuses on place(s) where one develops physical and symbolic relationships to specific places. *Living with* nature sees nature as other(s) with their own interests and agency (e.g. wildlife, ecological processes and other-than-human beings). Unlike the previous frames, *living as* nature refers to 'nature' [21] as a physical, mental and spiritual constituent of self (i.e. rejecting the people–nature dichotomy). *Living as* nature is a generalisation of diverse frames of oneness with nature [28], but recognises that many people do not conceptualise 'nature' in the dichotomous Western sense. Rather, it seeks to highlight non-dualistic, reciprocal understandings of the people and 'nature' relationship. *Living as* nature sees human-nature relations as non-dual, such as in the concepts of Pachamama or the web of life where humans and nature are seen as part of an extended community. This frame also challenges abstract value concepts, seeing them as embodied, reciprocal and dynamic, reflected in, for example, understandings of personhood of rivers, deep ecology, the land ethic and affordances in psychology [4]. The four life frames are not mutually exclusive.

Whilst worldviews represent the ways, perspectives or metaphorically the 'lenses' through which people understand and interpret the world, the life frames concept is a way to organise how people, policies and institutions 'spotlight' different sets of values based on a combination of factors regarding how they prioritise certain ways of being, living and relating to nature in its broadest sense [4,37]. Whilst different worldviews may prioritise certain life frames, they do not map 1:1 onto worldviews. For example, someone with a predominantly bio/ecospheric worldview will not just *live with* nature, but may also express values associated with the other life frames in different contexts. In this way, they are more flexible, but at the same time useful to understand how certain values are highlighted (or ignored) in particular decision-making contexts, thereby informing the design of integrated valuations.

Navigating the value typology's 'horizontal' and 'vertical' interactions

The way people express values is complex. Therefore, beyond creating a list of values, this typology's utility for transformative change lies in navigating its 'horizontal' and 'vertical' interactions within and among its value layers and types (Figure 1, Table 1). First, identifying *horizontal interactions* helps consider a spectrum of value types in a particular study or decision, including how people express divergent or overlapping values for the same elements or entities (e.g. biodiversity, ecosystems). For example, relational values referring to reciprocal obligations with other species may overlap with the justification of intrinsic value attributed to them, or similarly, there can be divergence between aspects of bio/ecocentric and pluricentric worldviews concerning the degree to which people are understood as part of nature [4]. Meanwhile, *vertical interactions* arise as when broad values emerge from worldviews and subsequently express contextually as specific values measured by appropriate indicators. For example, those with strong anthropocentric worldviews likely privilege utilitarian broad values, consider instrumental specific values and assess monetary cost–benefit indicators of sustainability. However, using money to indicate value may fail to capture the importance of intrinsic values and undermine the broad values espoused by those with bio/ecocentric or pluricentric worldviews. The life frames provide an effective way to cluster sets of values horizontally and vertically across diverse disciplines [4], providing a useful aid for organising and communicating the complexity of the diverse values of nature.

Below, we analyse two research/policy case studies to demonstrate how understanding the interactions within and among the typology's value layers and types can help meet the real-world challenges (e.g. GBF Target 1's participatory-integrated biodiversity-inclusive spatial

planning, Target 4's minimise human–wildlife conflicts or Target 29's full, equitable, inclusive, effective and gender-responsive representation and participation) of enhancing inclusive approaches to environmental research and practice and managing socio-environmental conflicts.

Enhance inclusive environmental research and practice

Horizontal interactions: Providing opportunities to express diverse value types within a layer is essential to achieve diverse stakeholder inclusion and overcome the persistent model that separates science/policy and knowledge production/decision-making [33]. For example, identifying horizontal interactions of specific values shows the diversity of stakeholder interests [4,42], as exemplified by an experience of inclusive management in India for the Himalayan wolf (*Canis lupus chanco*). Whilst shepherds persecuted wolves based on instrumental (e.g. property, livestock) and relational values (e.g. sense of security, cultural symbolism), conservationists justified their protection based on intrinsic values (e.g. biodiversity, charismatic species and ecosystem function) [43]. Recognising this suite of specific values allowed these actors to work together to decommission traditional wolf traps, pits called *shandong*. Achieving diverse stakeholder involvement implied acknowledging and respecting both divergent and overlapping specific values about wolves [43]. Doing so also allowed accommodating villagers' concerns via livestock insurance and construction of predator-proof corrals [43].

Vertical interactions: Sometimes, however, inclusivity requires engaging other layers of value. For example, moving vertically across the typology helps grasp how specific values are partially shaped by worldviews. In large part, the inclusive wolf conservation coalition appealed to many Buddhists' pluricentric worldview of embodied relationships between sentient beings and broad values of empathy, freedom from suffering for all beings, compassion and non-violence [44]. Yet, whilst in Buddhist villages, positive attitudes towards wolves were associated with religiosity, being female and higher education, many people still saw wolf hunting as an important livelihood and a culturally important means of protecting livestock (i.e. anthropocentric worldview) [43,44]. Therefore, accommodating these different perspectives was key to including an array of non-traditional participants (e.g. local residents, religious leaders and politicians) in actions to neutralise some *shandong* sites by creating an escape passage for trapped animals. However, rather than demolishing these structures, a *stupa* (Buddhist religious symbol) was built at decommissioned traps to activate broad values of compassion towards all life. Navigating this 'vertical' value interaction allowed bridging understandings of wolves. Such cross-layer integration also appears in the multiple life frames at play, which highlights that fairly representing stakeholders in research and policy-making necessitates considerations beyond methodological issues within a layer (e.g. integrating biophysical, monetary and sociocultural indicators) or seeking to change others' values [4]. Instead, the ability to also link multiple worldviews and broad values with specific values and indicators can promote inclusive processes for justice and sustainability.

Manage socio-environmental conflicts

Horizontal interactions: Divergent value prioritisation within a typology layer can lead to stakeholder conflicts; recognising horizontal interactions can help manage these discrepancies by identifying commonalities within otherwise-polarised situations. For example, the 1990s 'timber wars' in the U.S. Pacific Northwest centred on whether old-growth forests should be logged to generate income and jobs, or conserved to protect (among other species) the endangered northern spotted owl (*Strix occidentalis caurina*). Both loggers and conservationists believe the forest is important, but expressed different specific values. Logging was tied to instrumental values (e.g. lumber, income) and some relational values (e.g. identity based on a natural-resource livelihood, place-based connections). Conservationists considered nature largely via intrinsic values (e.g. protect owls and their habitat for their own sake) and other relational values (e.g. physical and mental relationships with the forest, identity based on symbolic value of 'pristine nature') and some instrumental values (e.g. water and climate regulation) [45]. Whilst initially portrayed as an irreconcilable conflict, a more nuanced analysis of these specific values demonstrates common ground [46]. Both groups expressed relational-specific values related to care and responsibility for the forest, despite different ways of acting upon them [45]. After the conflict dissipated somewhat, collaborative forest management groups formed, including environmental activists, loggers, forest industry representatives, managers and community members, to provide venues to constructively engage this suite of values and re-enforce shared ones. The process ultimately built trust and agreement on some mutually acceptable management actions in situations previously dominated by conflict [47].

Vertical interactions: Framing the 'timber wars' only as a divergence of value types at one layer (i.e. timber's instrumental values vs. owls' intrinsic values) neglects more profound roots of conflict. For some stakeholders, the disagreement was fundamentally about how forests and their management are conceived [45]. Accordingly, the expression of particular specific values should be understood as a partial reflection of contrasts between an anthropocentric worldview's focus on utility-oriented broad values such as security and prosperity (expressed as the instrumental values of timber and jobs) and a bio/

Table 1

Summary of examples navigating the 'horizontal' and 'vertical' interactions within and among the typology's value layers to confront two environmental research and policy-making challenges.

 Research and policy challenges	 Values plurality within a level	 Values plurality between levels
Enhance inclusive approaches to environmental research and practice	An ability to identify a range of specific values about wolves and their management allowed a conservation coalition between both conservationists and pastoralists [43].	Awareness of how different value layers shape one-another improved stakeholder engagement beyond traditional alliances. By appealing to Buddhist broad values in the context of wolf management, it was possible to include religious leaders, authorities and other community members [43].
Manage socio-environmental conflicts	Recognising not only differences, but also overlaps in values within a layer, clarifies positions to help ameliorate contentious situations, such as when loggers and conservationists focus not only on differences regarding instrumental versus intrinsic values, but also shared relational values of a forest [47].	An understanding of relationships among value layers helps determine the underlying reasons of a conflict, such as when logging is not only a difference of which values to prioritise, but whose worldviews and broad values are considered in decision-making. Finding the roots of conflicts can enable better consideration of mutually acceptable actions or reframing the problem in constructive ways [45].

ecocentric worldview's emphasis on sustaining broad values such as the right of 'wild' nature to persist without human interference (expressed as the intrinsic value of owls and old-growth forests). Different life frames of nature provide a helpful way to visualise or communicate these interactions, whereby loggers *live from* nature (combining anthropocentric worldviews, utility-oriented broad values and instrumental and relational-specific values), and meanwhile environmentalists *live with* nature (combining bio/ecocentric worldviews, wilderness-oriented broad values and instrumental and relational-specific values). Importantly, other ways of framing were not reported in predominant portrayals of the conflict, even though other initiatives were taking place. For example, contemporaneously, the Yakama nation was practising forest management on their lands to produce marketable timber and preserve spotted owl habitat. Guided by an Indigenous worldview that considers 'land, plants and animals are interdependent' [48] (p. 17), the Yakama employed academic and Indigenous knowledge to create site-specific resource assessments and conservation strategies with diversified land use (*ibid*). This approach accommodated conservation- and business-oriented specific values by interpreting them through the deeper levels of the Yakama worldview. In summary, for contentious situations, navigating the typology's vertical interactions clarifies the deeper values involved in a dispute (to identify and discard proposed solutions that are not aligned) and provides new framing opportunities to reconcile seemingly incompatible values (to overcome problems portrayed in intractable ways) (Table 1).

Conclusions

Most environmental policy contexts largely rely on instrumental, anthropocentric conceptions of people–nature relationships [49]. Here, we have presented an inclusive typology that opens possibilities for engaging diverse meanings of value, including worldviews and knowledge systems. The typology invites environmental scholars and decision-makers to explore nature's multiple values and their interrelationships more thoroughly. Below, we provide guidance on how this typology of values can further inform transformative change for just and sustainable futures, based on four value-centred leverage points [50].

a) *To recognise the values of nature, the typology clarifies concepts and aids comprehension across understandings of values to help conduct plural valuations of nature.* Most ecosystem service research has focussed on assessing the distribution and/or extent of instrumental values measured in biophysical and monetary terms [51], and the *living from* nature (nature's capacity to provide resources for sustaining livelihoods, needs and wants) has been the dominant people–nature relationship framing of valuation studies [2]. Nature's intrinsic values have also been considered, but to a lesser extent [4,27]. However, work with Indigenous peoples and local communities, often with pluricentric worldviews and diverse knowledge systems, has revealed new options for sustainability transformation [52]. The typology provides a tool to identify how multiple value layers and types shape decisions within social–ecological contexts, expanding on existing plural valuation of nature for justice and sustainability [53].

b) *To embed values in decision-making, the typology helps recognise not only what, but whose values are at stake in decisions.* Sustainability transformation studies document a critical need to shift from individualism, materialism and economic profit to other principles such as care, unity, equity, reciprocity and justice [4,16,54]. Such a value shift implies systematic incorporation not only of 'what' values, but 'whose' are considered in decision-making. Traditional environmental decision-making ignores this contestation by purporting to separate 'facts' from 'values' [55], biasing approaches to quantitative costs and benefits (e.g. hectares, dollars). Aligning with recent agreements [56], this typology supports embedding multiple values via participatory decision-making process to address complex issues such as when trade-offs between different types of values cannot be easily resolved due to issues of incommensurability [57]. It provides a road map for better diagnosis of under- and over-represented worldviews, knowledge systems and conceptions of people–nature relationships, and how they can be associated with one-another in decision contexts. Given formal adoption by IPBES, it can gain legitimacy as a tool for those marginalised groups seeking to embed their values into political processes and overcome historical power relationships that privileged only some values.

c) *To institutionalize reforms that account for a greater diversity of values within and across layers, the typology of values helps align policy goals (i.e. broad values) and targets (i.e. value indicators).* For example, in New Zealand, governmental reforms to goals and target-setting contributed to more inclusive well-being policy-making. New Zealand's Living Standards Framework, designed to guide its Treasury Department's decision-making regarding resource allocation, includes health and well-being indicators that better reflect children's well-being and is more compatible with Māori knowledge systems [58]. This institutional reform has enabled expression of instrumental, intrinsic and relational values in other policy and legal domains, including the 2022 *Pae Ora* (Healthy Futures) Act with a focus on health equity (e.g. across Māori, disability, rural and women's communities) and building enduring relationships across health sectors [59]. Like in the New Zealand case, other governments could draw upon the typology of values as a means of thinking about how to consider a broader set of values in their well-being assessments.

d) *To shift societal norms and goals, the typology facilitates alternative transformation discourses and pathways.* Worldviews and broad values reflect general goals people strive for, they mainly affect behaviour indirectly via norms. Situational factors that encourage respecting common norms can activate sustainability-aligned values and promote pro-environmental behaviour (e.g. people are less likely to litter in a litter-free environment) [60]. The typology of values helps policymakers widen the framing of social influence strategies, for example, by highlighting possibilities for appealing to social norms in information campaigns concerning fairness, the protection of future generations and the environment. Yet, the rapid and radical transformations needed to address the biodiversity crisis imply a much larger and faster change in societal norms, including a change to the parameters of how we understand limits and the capitalist imperative of growth [61]. The typology enables recognition and consideration of alternative philosophies of good living, including those that challenge dominant perspectives such as the unlimited economic growth agenda (e.g. those aligned with post-growth economics [62], the Andean–Amazonian political project of *Buen Vivir* and life philosophy of *Sumak Kawsay*, the Bantu philosophy of *Ubuntu* and the Japanese tradition of *Satoyama*, among others). These perspectives, present among many Indigenous peoples, local communities and other knowledge traditions, may otherwise be neglected or silenced when only a narrow set of values or a single worldview is considered in decision- and policy-making [4]. For instance, *Buen Vivir* promotes shifts to 'slow tourism', requiring development strategies to be local-scale and benefits host communities [61].

Whilst this typology of values offers an overview of different meanings of value, fully operationalising it in decisions requires other considerations. First, it is important to understand the debate on individual versus shared values and the dynamics through which values are formed and change [3]. Also, confronting power structures and inequities when engaging diverse stakeholders is critical [63]. Despite the importance of nature's values in decision-making, other drivers also promote (or constrain) people–nature interactions [2]. Therefore, even when diverse values are represented in environmental scholarship or policies, acting in ways that align with them may be hindered politically, legally or practically. For example, some Indigenous peoples cannot interact with their traditional lands in accordance with their values of care and reciprocity because they have been displaced, and similarly many local communities may choose different ways to farm or harvest trees, if they were able to have more secure livelihoods less dependent on short-term income in volatile markets, or addressing climate change vulnerabilities.

Future academic studies and practical experiences could build on this recognition of the diverse values of nature and their importance for concrete decision-making

contexts by explicitly addressing how different types of institutional situations and power relations in both scholarship and policy-making affect what value concepts are studied, considered, expressed, aggregated, obscured or substituted. Approaches that embed the tyoplogy of values within existing conflict negotiation processes could also empirically examine how these interactions influence management and resolution, but also the potential to form shared social values among individuals and groups via deliberative processes. We expect that through such applications, power relationships and institutional biases towards different worldviews and values will become more transparent. In closing, there is an established need (e.g. GBF) to provide tools to advance the inclusion of nature's multiple values in decision-making, and this typology of values provides conceptual clarity as a practical way to advance that agenda.

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Given their role as Guest Editors, Unai Pascual and Michael Christie had no involvement in or access to information regarding the peer-review. Full responsibility for the editorial process of this article was delegated to Patricia Balvanera.

CRediT authorship contribution statement

CR led the writing (original draft) of the paper; CBA, SA and AV coordinated the work of the whole team (2018–2022), with the support of MC and UP. CR, CBA, AH, BM, RG, JK and RM coordinated the case examples; and all authors coordinated the analysis of the evidence and wrote (reviewed and edited) the various versions of the paper. CBA, SA, AV, AA, PA, MC, RG, AH, JK, DL, BM, RM, SO, SS, AS and EZ collected and analysed the assessed data.

Data Availability

All data sources relevant to this perspective can be found at: https://doi.org/10.5281/zenodo.6493134.

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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Current Opinion in Environmental Sustainability

Justice, sustainability, and the diverse values of nature: why they matter for biodiversity conservation☆

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Aiming at just and sustainable futures for biodiversity conservation requires clarity concerning how justice relates to the diverse values of nature. By drawing upon and expanding on the recent Values Assessment of Intergovernmental Platform on Biodiversity and Ecosystem Services, this article discusses the implications of the diverse values of nature for different dimensions of justice. It also addresses how achieving transformative change that protects biodiversity requires the inclusion of diverse values of nature into valuation and decision-making processes, and how this imperative is interconnected with different dimensions of justice.

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Introduction: how justice and sustainability are linked to biodiversity conservation

Successive assessments of the Intergovernmental Platform on Biodiversity and Ecosystem Services (IPBES), including the Global Assessment [29] and the Values Assessment (VA) [30], have aligned with the view that addressing the current biodiversity crisis requires transformative change toward more just and sustainable futures. Justice is an end in itself, perhaps even the 'first virtue of social institutions' [51], and demands that we ask of all proposed new social arrangements 'are they just?' [23]. The pursuit of justice can also be considered as a means to an end, for example, by overcoming 'justice barriers' to sustainability [39]. Evidence shows that biodiversity conservation interventions that create inequalities often lead to loss of legitimacy and ultimately to conflicts, reducing their uptake and effectiveness [59,8]. Whether as an end in itself, a means to sustain-

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Table 1

Dimensions of justice.

Dimension of justice	Scope of application	Example of injustice
Distributive justice	Who enjoys access to nature's benefits, who bears the burdens of loss and damage, and who bears the consequences of actions to protect it	Unequal access to and control over nature and its benefits, unequal exposure to the harmful impacts of biodiversity loss, or the socio-economic burdens derived from efforts toward conservation
Procedural (or participatory) justice	How decisions are made concerning nature and nature's benefits, who gets to participate, and what entities are to be represented and on what terms	Limited or no involvement of those most directly affected by the way nature is managed, limited, or no representation of the interests of other-than-human nature
Recognition justice	What status is afforded to relevant actors, in particular the respect for different knowledge traditions, identities, and values across social structures such as gender, ethnicity, or worldviews	Intolerance or disrespect of different worldviews, knowledge traditions, and human-nature relationships, including different ways of knowing and living with nature, status inequalities based on forms of discrimination, including patriarchy, racism, and coloniality

ability, or as a component of sustainability, justice has been part of sustainability discourse at least since the Brundtland formulation of 'sustainable development' [61]. The pursuit of justice is also reflected in the globally negotiated consensus threading through international agreements such as the Sustainable Development Goals (SDGs), placing justice at the heart of transformations to sustainability.

However, the understanding of justice in such documents or in the sustainability arena more generally is often vague [65], and the relationship between justice and the diverse values of nature remains unclear.[1] This undermines the pursuit of just and sustainable futures for biodiversity conservation. In this paper, we explore the interconnections between justice and the diverse values of nature for biodiversity research, policy, and practice aimed at transformative change, building upon the recent IPBES VA [30]. We begin by offering a brief contextual background to the key conceptualizations of environmental justice that influenced the VA. We then critically reflect upon the tensions and opportunities that become apparent through a focus on the role of diverse values of nature for promoting just and sustainable futures. Finally, we explore the implications of the diverse values of nature for the design of transformative pathways for life on earth and for the people on this planet.

[1] The term 'nature' is used in this paper according to the IPBES Glossary definition. It encompasses both the Western understanding of nature as articulated in science and other ways of expressing the other-than-human-world according to diverse knowledge systems, including nondualistic perspectives. See: https://www.ipbes.net/glossary-tag/nature. The term 'biodiversity' is also used in this paper as defined in the Glossary, encompassing variability among all living organisms, including among genetic, phenotypic, phylogenetic, and functional attributes, and alterations to the distribution or abundance of species, biological communities, and ecosystems. See: https://www.ipbes.net/glossary-tag/biodiversity.

Principles and dimensions of justice in the Intergovernmental Platform on Biodiversity and Ecosystem Services Values Assessment

The global sustainability discourse has increasingly acknowledged that achieving sustainability is related to an agenda of justice or equity (often a synonym for justice). Since the Brundtland report [61], most international documents on sustainability have adopted a 'do no harm' principle that environmental protection should not be achieved at the cost of greater social inequalities. Nonetheless, the imperative to enact positive change is increasingly recognized. For instance, 'leaving no one behind' is a core principle of Agenda 2030 and underlies all seventeen Sustainable Development Goals [62]. However, questions about which harms or inequalities need to be reduced, and to what extent, are rarely discussed explicitly. Although certain core characteristics of justice have been identified, the way they are interpreted depends on ontological, epistemological, and ethical assumptions that are contested [58]. For instance, the Intergovernmental Panel on Climate Change [31] recognizes that mitigation measures may affect poverty alleviation, and states that the responsibilities and burdens of climate change mitigation should be distributed among countries based on their responsibility for greenhouse gas emissions as well as their capacity to act. While important, the distribution of environmental benefits and burdens is only one component of justice, and does not reflect the complexity of understandings of justice in the academic literature, nor those of environmental activists and affected communities themselves.

While it is difficult to offer a working definition of the concept of justice that adequately represents its complexity, we present and briefly articulate three core dimensions of justice in the sustainability discourse: *distributive*, *procedural*, and *recognition* justice [56] (Table 1). These articulations build upon yet go beyond the articulations of justice dimensions in the VA.

Distributive justice refers to the fair sharing of benefits and burdens resulting from the use, management, ownership, or conservation of nature. Distributive justice arises within political communities such as nation-states, between nation-states, between the Global North and South, between generations, and across social groups. Much normative literature focuses on the fair distribution of natural resources and ecosystem services [5,10,28,54,57] and the unfair burdens of conservation [6]. There is normative debate about whether such a distribution should be egalitarian [5,28] or should target basic human needs [10,54]. Distributive questions also arise in relation to the variety of material, regulatory, and nonmaterial contributions of nature to people [19], which are increasingly unequally distributed [20]. A related debate is whether sustainability is conditional on (and for) a fair distribution of costs and benefits [34], a view that has gained standing since the Brundtland Report [61]. While the scope of much distributive justice literature is limited to considering fair shares between human beings, there are also arguments to expand the scope to nonhumans [48,56].

Procedural justice refers to the fairness of decision-making processes: how decision-making and conflicts are framed and managed, including who has the formal and effective right to determine governance systems, to participate in decision-making, and on what terms. In this respect, the VA showed that only 1% of valuation studies reported the meaningful involvement of the stakeholders affected by a decision in all the stages of the valuation process. Power asymmetries typically privilege the representation and participation of certain voices in decision-making to the exclusion of others, such as when people directly affected by decisions (such as the location of a landfill site) are marginalized in environmental policymaking, or when anthropocentric discourses prevent the representation of other-than-human nature [3,30].

Recognition justice refers to the status afforded to relevant actors, in particular the acknowledgment of and respect for different conceptions of values, different identities, and diverse knowledge systems and practices. This is the case when people are discriminated against according to identity categories such as gender or race. Recognition injustice may also involve the marginalization of ways of knowing and valuing nature that do not correspond to dominant economic, political, or cultural interests. For example, kinship relationships with other-than-humans, or relations with ancestors and spirits, are often highly valued within Indigenous worldviews, yet are often ignored or suppressed by outside conservation planners [1,30,40,55]. Epistemic injustice [24], which has entered the sustainability discourse more recently [60], refers to the failure to ensure respect and equality of status for diverse knowledge systems. It can be considered as a specification of recognition justice that focuses on discrimination rooted in knowledge. Decolonial approaches to epistemic justice reframe recognition in terms of the active participation of Indigenous peoples and local communities (IPLCs) as *knowledge-holders* speaking for themselves in their own terms and as equal partners in framing the issue and the modalities of valuation — instead of including communities and their knowledge as subjects of study and research led by others [2]. This has resulted in promoting biocultural diversity to complement the understanding of nature reflected in Western science and policy [45].

The three dimensions (distributive, procedural, and recognition) of justice are interlinked and can be difficult to separate in practice [41]. The Environmental Justice movement in the United States of America highlighted the unfair distribution of environmental hazards for people of color and discriminated communities, challenged government procedures that systematically produced these inequities, and analyzed structural causes of injustice relating to race/ethnic background and poverty [13]. Grassroots environmental justice movements worldwide have consistently demanded redistribution of environmental benefits and burdens, for example, concerning the ecological debt of early industrialized countries, along with the need for legitimate participatory processes and recognition of their own justice narratives [42]. When IPLCs claim justice in relation to their territories, such as in the case of the Maasai fighting against 'conservation' land grabs, their struggle cannot be framed in terms of one specific dimension of justice because for them, livelihoods, participation, and identities are inseparable in the context of their relationships with land [37].

Rethinking justice and sustainability in light of the diverse values of nature

The perspective of the diverse values of nature in the VA offers important insights in the discussion about justice and sustainability transformations [3,7]. Within the VA, justice is defined as a broad value, defined as life goals and guiding principles, including what constitutes desirable people–nature relationships. While broad values transcend specific contexts, they are embedded in worldviews. Instead, specific values are judgments regarding the importance of something in a specific context, including biodiversity, ecosystems, people–nature relationships, or human well-being [3,52]. Expressions of specific values (such as the economic value of a particular ecosystem service or the importance of treating a particular species as kin) are not considered as claims of justice, but connect with a more general principle that demands the fair consideration of specific values held by different groups of people.

Three tensions between universal claims of justice and value pluralism

Beyond the context of the VA, justice claims such as the imperative to eradicate poverty, the right to cultural recognition, or the pursuit of sustainability are characterized by an intended universality — they are supposed to apply to all humans. Such a universal understanding of justice can be in tension with perspectives that highlight value pluralism, as in the VA. Concrete justice claims may reflect particular understandings of humans and nature that depend upon context and positionality, and are rooted in particular knowledge systems and practices. While we cannot engage with the philosophical debate concerning ethical universalism here, evidence from the VA shows the need to acknowledge the potential coloniality of universalism that is epistemically 'disembodied': concealing the specific ideological and cultural place from which they arise (i.e. Western science or Christian values), thus confining alternative knowledge systems, values, and practices to merely local and traditional views, or submerging them within a dominant narrative. From a decolonial perspective, claims of justice can be universal (or general) but also remain historically and geographically situated: they address asymmetric power relations and are open to horizontal interepistemic encounters across diverse knowledge systems that mutually recognize each other as equals; and foster coexistence, mutual respect, and cross-fertilization [25].

A second tension between justice and value plurality emerges when distributive justice is limited to use values for human beings, which as we saw above, remains widespread political philosophy, and in neoclassical economics [18]. This assumes a strong anthropocentric worldview (i.e. one that considers nature only in terms of instrumental means to human ends) and ignores other values and people–nature relationships (intrinsic or relational values).[2] This assumption may have severe policy implications, for instance, prioritizing poverty alleviation at the expense of biodiversity conservation [43]. Instead, biocentric and ecocentric worldviews favor extending distributive justice beyond the scope of human beings to protect the interests or flourishing of nonhuman species [9,56,64].

A third tension arises from the inherent normativity of the concept of sustainability, and related concepts, including biodiversity, which are typically implied to be valuable or desirable [47]. The VA acknowledges the legitimacy of diverse perspectives about sustainability and biodiversity, based on the conviction that different individuals and communities have the right to meaningfully participate in conservation policies affecting them — a claim of procedural justice — and a right to speak for themselves in their own terms — a claim of recognition justice [3]. However, openness to value diversity may be in tension with the normative goal of sustainability in the case of values that do not support sustainable outcomes. For example, the values underpinning the extractivist model of economic development may undermine the rights of local communities, future generations, or the concerns of nonhuman entities. This is especially problematic because these values are often held by those with greater decision-making power. Sustainability-adverse outcomes can also occur when culturally significant practices or landscapes are preserved at the expense of biodiversity conservation [3,35].

Justice-related insights from the Intergovernmental Platform on Biodiversity and Ecosystem Services approach to values

Insights from the VA provide responses to these tensions, allowing for richer understandings of justice to be reflected in the context of sustainability transformations. First, the VA goes beyond merely saying that justice is served by recognizing value diversity. It also matters which values are considered, and whose values they actually are. This makes for an irreducibly normative discussion of which values are 'desirable' to foster transformative change, a point acknowledged in sustainability science [46]. Certain broad values (e.g. stewardship or care for nature) associated with human-nature relations or human–human relations were identified as conducive for transformative change toward sustainability, while others obstruct these outcomes (e.g. prosperity through continued material growth) [27]. The implication is that a just transformation to sustainability requires nurturing some positive broad values while seeking to reduce the influence of other values. However, promoting values that align with sustainability and justice is no easy task. This goal entails addressing 'just sustainability', which involves recognizing the expectations and goals of different actors as well as their cognitive modes of relating to nature in all of its different facets [44]. Context-specific approaches to sustainability-aligned values will be needed in alignment with different justice perspectives and priorities. Marginalizing contextual interpretations of sustainability-aligned values would also favor the interests of certain actors over others. For instance, the global conservation movement emphasizes the importance of intrinsic values associated with 'pristine nature', in contrast to instrumental and relational values held by local communities whose sustainable livelihoods depend on multifunctional landscapes [49].

Second, procedural and recognition justice are crucial, interrelated requirements for sustainability

[2] For a definition of strong and weak anthropocentrism see Raymond et al. [52].

Table 2

Value-centered leverage points and examples of justice-oriented actions.

	Distributive justice	Procedural justice	Recognition justice
(i) Undertaking valuation that recognizes the diverse values of nature	Apply valuation methods that explicitly allow for assessing outcomes valued by all relevant actors, and how benefits and burdens are distributed	Ensure the meaningful participation of all relevant actors in every stage of the valuation process, especially marginalized actors	Coproduce methods that assess locally meaningful values and goals in appropriate language and units that reflect diverse ways of seeing, knowing, and inhabiting the world
ii) Embedding valuation into decision-making	Apply valuation findings in decisions in ways that ensure that the diversity of values is considered and that addresses inequitable impacts across different relevant actors	Ensure that all relevant actors understand the implications of being part of valuation processes and that their views are taken into account and reflected in valuation-based decisions	Introduce forms of due diligence to ensure that values held by historically marginalized actors are afforded high status in decision-making, and that diverse values are recognized and respected
iii) Reforming policies and regulations to institutionalize fair treatment of different actors' values	Reform formal policies and other institutions in ways that regularize decision-making that gives fair weighting to different actors' values and that avoids unequal distribution of benefits and burdens, with particular emphasis on those who have traditionally borne disproportionate burdens	Reform decision-making instruments, processes, and spaces (e.g. legislative chambers) to design and implement mechanisms that serve to regularize the full participation and/or representation of all relevant actors	Reform policies and regulations (including laws and systems of accounting) in ways that institutionalize rights and recognition for all relevant actors across different types of knowledge, worldviews, and values
(iv) Shifting underlying societal norms and goals to emphasize the links between justice and sustainability	Promote the inclusion of sustainability goals across sectors and scales that integrate intra- and intergenerational distributive justice dimensions	Confront and reconfigure existing structural and discursive power through actions to secure the participation of actors that represent different worldviews, goals, and visions regarding progress, justice, nature, and sustainability	Encourage inclusive, transparent, intercultural, intergenerational, and intersection dialogs about the norms and goals that shape visions of just and sustainable futures

Source: Adapted from IPBES [30].

transformations. Achieving procedural justice requires that the groups and communities expressing diverse values are involved throughout a valuation or decision-making process. Yet, such participation may be insufficient to ensure meaningful inclusion if the worldviews and value systems do not belong to dominant perspectives, and may even harm community identities [17]. Implementing recognition justice implies acknowledging the status of underrepresented groups and collaborating with them to design methods, institutions, and processes that enable the articulation of diverse values in their own terms, including alternative conceptions of a good life rooted in collective autonomy and self-determination [11]. Lack of recognition can also be evident in the impossibility of expressing grief or loss within a dominant language frame or knowledge system [33], undermining attempts at procedural inclusion. For example, the Southern Resident Orcas in the Salish Sea are considered by the Lummi people to be family members, yet relational values associated with kinship relations cannot be expressed within the dominant language of conservation as intrinsic or instrumental values [26].

Third, the VA suggests fruitful ways of addressing the tension between justice and diverse values of nature, showing how weak anthropocentric worldviews highlight noninstrumental relationships with the natural world, and how relational and noninstrumental values can be interrelated with distributive justice. Distributive justice can be advanced by explicitly incorporating the diverse values of nature, thereby intertwining it more directly with recognition justice. The universal entitlement to a fair distribution can be reframed by replacing the policy focus upon natural resources with an emphasis on capabilities or basic needs that integrate diverse values of nature and human-nature relationships (e.g. [48,56,36]). This would involve showing how relationships with nature or among people through nature are constitutive of collective identities or necessary conditions for a good life (i.e. a dignified and flourishing life) within the community. This would also imply widening the consideration of what counts as a condition for a good life to include, inter alia, right relationships with nature, and the intercultural recognition of conceptions of right relationships. In these ways, the insights from the VA echo call for ethical pluralism in biodiversity conservation [16]. In some contexts, interlinking distributive and recognition justice in the light of the diverse values of nature might also require extending the range of subjects of distributive justice, beyond future generations (commonly accepted in the sustainability discourse) to

include, for example, other species, along with ancestors, spirits, or other forms of being. Further, an interlinking of distributive and recognition justice would challenge the focus on individuals as subjects of harm and extend it to communities. Securing self-determination rights and sovereignty by IPLCs over their territories is a fundamental step to support worldviews and values aimed at improving local livelihoods while sustaining biodiversity [53].

Explicitly recognizing and including the marginalized values of nature into decision-making processes is not only desirable as an end in itself but also means to environmental decision-making that offers better social and ecological outcomes [12,14,66]. Linking recognition (and epistemic), procedural, and distributive justice can help identify the root causes of injustice.

The way forward: value-centered leverage points for just and sustainable futures

The VA identified four value-centered leverage points that would enable the achievement of more just and sustainable futures: (i) undertaking valuation that recognizes the diverse values of nature; ii) embedding valuation into decision-making; iii) reforming policies and regulations to internalize nature's values; and (iv) shifting the underlying societal norms and goals. Activating the most far-reaching leverage points, that is, reforming policies and shifting goals, implies a reconfiguration of power relations among actors prioritizing different relations to and associated values of nature [4,30,40,63], which in turn largely depend on the capacities of actors to mobilize agency, resources, and discourses to change social structures [3,4,32]. Table 2 provides examples of actions that can be taken in relation to the different leverage points to promote distributive, procedural, and recognition justice, acknowledging that power disputes and conflicts would likely emerge when undertaking them.

Enabling transformative change relies on supporting the interdependencies between the three dimensions of justice. The Convention on Biological Diversity addresses distributional justice in conservation interventions by promoting schemes such as fair benefit-sharing, wildlife compensation, relocation schemes, and the provision of 'alternative livelihoods' [15]. However, the use of financial mechanisms rarely compensates for injustices of recognition [38]. For example, compensation payments to a farmer who loses sheep to bears or other predators does not address identity-based harm arising from the farmer's relational values, tied to an identity as a carer for her flock [35]. Conversely, efforts to incorporate IPLCs into existing decision-making processes, when not accompanied by meaningful recognition of their territorial rights, can promote a superficial kind of value recognition that does little to advance procedural or distributive justice for IPLCs, or may even fuel biopiracy and continued exploitation of biocultural resources.

Conclusion

We argue that in addressing the biodiversity crisis, it is essential to acknowledge the many different visions of what constitutes a just and sustainable future. Achieving transformative changes toward living in harmony with nature depends on the consideration of justice and sustainability both as ends and means. Identifying specific actions across the four values-centered leverage points identified by the IPBES VA requires consideration of the different dimensions of justice and their interdependencies. The contentious '30x30 targets' of the Kunming-Montreal Global Biodiversity Framework may serve as an example to illustrate the crucial interlinkages between justice, sustainability, and the diverse values of nature. Target 3 has been questioned by economic interests opposing ambitious conservation efforts, but also by Indigenous communities concerned that the protection of biodiversity in their territories could lead to their displacement or to restrictions on their traditional ways of life. The final agreement does touch upon recognition (e.g. by acknowledging the important role and contributions of IPLCs as custodians of biodiversity), distribution (e.g. by facilitating a significant increasing in sharing benefits from genetic resources), participation (e.g. through participatory-integrated biodiversity-inclusive planning), as well as value pluralism (e.g. the different embodied concepts of Nature and its contributions to people), as a means to achieve the vision of Living in Harmony with Nature. Yet, actually correcting the disproportionate benefits and burdens of protecting (and degrading) nature, acknowledging the diverse values of nature at stake in ways that are fully respectful, and meaningfully incorporating the voices of all relevant actors into decision-making remain as urgent future challenges.

Transforming conservation approaches implies elevating the broad value of justice by honoring the diverse ways in which living in harmony with nature can be conceived. It also implies focusing on the social (institutional, political, and economic) structures that are at the core of the drivers behind biodiversity loss (e.g. material and energy growth in the Global North), the fair distribution of benefits and burdens of changes to the provision of nature's contributions to people, and empowering the marginalized voices into all the phases of goal- setting and the design and operationalization of conservation interventions.

Affirmative action to respect the diversity of values about nature is foundational to putting justice at the

center of any kind of transformative governance model for biodiversity conservation: affording equal status across actors and not making this contingent on the discourses of dominant political and economic actors [21,50]. While aiming at just conservation is normatively desirable, the IPBES VA shows that it is also a means to improve biodiversity-related decision-making (e.g. by bringing more relevant knowledge to the table), and to strengthen cooperation in favor of biodiversity (e.g. by going beyond a narrow set of instrumental motivations for conservation). As long as people perceive that biodiversity policies disregard them and their values, measures taken to protect biodiversity will fail [49]. And as long as powerful sectors of society and institutions continue to oppose sustainability-aligned values, the transformative changes needed to bring about more just and sustainable futures will remain out of reach.

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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Chapter 2 of the VA reviews the academic literature as well as contributions from IPLCs presenting Indigenous and Local Knowledge on the topics of the multiple conceptualizations of the values of nature. It explores how diverse values of nature emerge from the different ways people understand, interpret and experience human-nature relationships, expressed in diverse worldviews, languages and knowledge systems.

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Current Opinion in Environmental Sustainability

Whose values count? A review of the nature valuation studies with a focus on justice

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The Values Assessment of the Intergovernmental Science-Policy Platform on Biodiversity and Ecosystem Services shows that multiple valuation methods and approaches exist to assess diverse value types. The evidence is based on the largest review of academic valuation studies on nature to date, developed for the Values Assessment of the Intergovernmental Science-Policy Platform on Biodiversity and Ecosystem Services (IPBES). We evaluate studies according to environmental justice criteria. The results suggest that although diverse value types and indicators are assessed across studies, few individual studies are plural, and studies fail to provide evidence on distributive justice and score low on procedural justice indicators. We provide a set of recommendations for incorporating issues of justice in the design of valuation studies.

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This review comes from a themed issue on **Values for transformative change: The IPBES approach**

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Introduction

Recognising the diverse values of nature and nature's contributions to people (NCP) is considered a key leverage point for transformative change towards just and sustainable futures [14]. These diverse values underpin and shape policy objectives, actions and

interventions towards achieving goals related to nature and ecosystems [29]. Recognising value plurality requires that stakeholders who hold different values are considered and involved in valuation practices and decisions based on those values [50]. However, power imbalances may imply that some stakeholders and values are disregarded [30]. This can cause large disparities in benefit and burden distributions [3], and a lack of social acceptance and legitimacy [7], and ultimately lead to a lack of compliance, or even conflicts and policy failure [11,36].

The ability of valuation to contribute to transformative change hence depends on considering three standard dimensions of environmental justice: distributive, procedural and recognition justice [40]. Distributive justice concerns the fairness of the distribution of burdens or losses and benefits or gains, and relates to the outcomes of policies [22]. Procedural justice refers to fairness of the political processes in which natural resources, ecosystem services or NCP are distributed (ibid.), which is important both for democratic reasons and for the effectiveness of policies [8]. Finally, recognition justice considers plural values, grounded in the respect for ways of life, local knowledge and cultural differences [38], is important to develop integrative, contextualised and inclusive interventions. It requires that social structures that produce discrimination and disrespect are not reproduced in the valuation process and outcomes [20].

Incorporating ideas of environmental justice into valuation studies engages with the central question of 'whose values are assessed'. The answer depends on who is identified as a relevant stakeholder (community of justice) or affected party (distributive justice), who can meaningfully participate in decision-making (procedural justice) and whose and which values are included (recognition justice). Furthermore, the term 'value' has different meanings across cultural, academic and decision-making contexts. Sustainability, justice and prosperity are broad values influenced by worldviews [1]. Broad values in turn influence specific values (intrinsic, instrumental and relational) in given situations and contexts [33]. These considerations involve specific choices for the procedural design of a valuation study as well as the choice of valuation method(s) [44]. The Values Assessment (VA) of the Intergovernmental Science-Policy Platform on Biodiversity and Ecosystem Services (IPBES) provides strong evidence that numerous valuation methods and approaches exist to assess diverse values of nature [44]. Wisely combining methods could capture the wide variety of values of diverse stakeholders. However, in practice, achieving justice in valuation is challenging because of the political context in which valuation studies are conducted, and practical limitations [21,27]. This systematic literature review focuses on the extent to which valuation studies meet environmental justice objectives in their design and implementation.

As the largest review to date of the academic valuation literature on nature, NCP and ecosystem services, we use a set of criteria developed in the IPBES VA database to assess valuation studies along distributive, procedural and recognition justice dimensions. Based on the review, we recommend approaches to better address justice in valuation studies.

Review

Evaluation criteria

We developed a set of evaluation criteria (see Appendix A for full details) to assess the community of justice considered in studies, and to what extent empirical valuation studies have built distributive, procedural and recognition justice aspects into their design and execution [39].

Community of justice

Underlying the question of whose values count in valuation studies is the consideration of the *community of justice*, that is, which entities (human or otherwise) are considered entitled to moral consideration and therefore relevant for the application, deserving to be treated justly and their values included [40,48]. This can involve (subgroups of) the current human population, but also be expanded to include future or past generations (for intragenerational equity), as well as animals, non-human beings or mother earth. For example, the 'living with nature' life frame links conservation of biodiversity with interspecies justice [1].

Distributive justice

We evaluated whether studies provided insight into the distribution of outcomes as a societal goal that the study informs, where this distribution is assessed in terms of *intragenerational* justice, that is, the distribution of nature-related gains and losses within one generation, and *intergenerational* justice, that is, the distribution across generations. We recorded how distributive justice was assessed, for example, through disaggregation (across generations, stakeholder groups, locations or other sociodemographic dimensions), inequality indices or perceptions of distributive justice and needs of future generations.

Procedural justice

To assess the procedural justice of valuation studies, we considered (a) representation related to who is involved in the valuation study and whether the sample is either statistically or politically representative [13], (b) inclusiveness of the valuation procedures in the extent to which participants are enabled to get involved through adapting the procedures to the capacities of the

participants, (c) participation level and the extent to which involvement is meaningful and allows participants to influence the procedures and outcomes [46], (d) addressing power imbalances to foster participatory parity [6] and (e) transparency of the process [6].

Recognition justice

To assess the extent to which valuation studies were *inclusive* [20,37], we evaluated whether studies included different types of knowledge, such as scientific, lay people's or policy-makers' knowledge. The extent to which *broad values* [1,17], defined as the underlying perspectives, worldviews and life value frames that underpin values, were identified was evaluated by considering whether the applications explicitly mentioned concepts such as reciprocity, enjoyment, tradition or prosperity associated with the four different *life value frames* by O'Connor and Kenter [26].

Following the IPBES conceptual framework [12] and the IPBES Europe and Central Asia assessment [16], we evaluated whether the studies assessed different valuation *targets*. These 32 targets relate to three main dimensions: (a) values directly linked to nature itself (including biodiversity and ecosystem structure and processes); (b) values derived from NCP (regulating, material and non-material); and (c) values linked to good quality of life (e.g. cultural, societal and individual well-being values). These targets can be grouped into value foci (see Appendix A). We reviewed applications for their assessment of *use and non-use* values following the Total Economic Value (TEV) classification [45]. For the classification by Díaz et al. [12], we recorded whether studies valued *intrinsic, instrumental or relational values*. We include both these value frameworks as we do not want to exclude or prioritise any particular value definition or introduce bias towards any classification.

We acknowledge that some of the criteria are interrelated or dependent, such as the community of justice and distributive equity, and the community of justice and who is being represented in the study, and therefore refrain from aggregating overall 'scores' of studies over the justice domains.

Data

The data are drawn from a systematic review, developed for the IPBES VA. The dataset represents the most extensive review of academic, peer-reviewed papers written in English and reporting on global valuation studies. Details of the method can be found in Appendix B. Our results are based on an analysis of 1163 studies that presented empirical valuation evidence. The sampled studies covered different valuation methods from various disciplines, which use monetary, biophysical and sociocultural indicators to assess values (see Appendix C).

Results

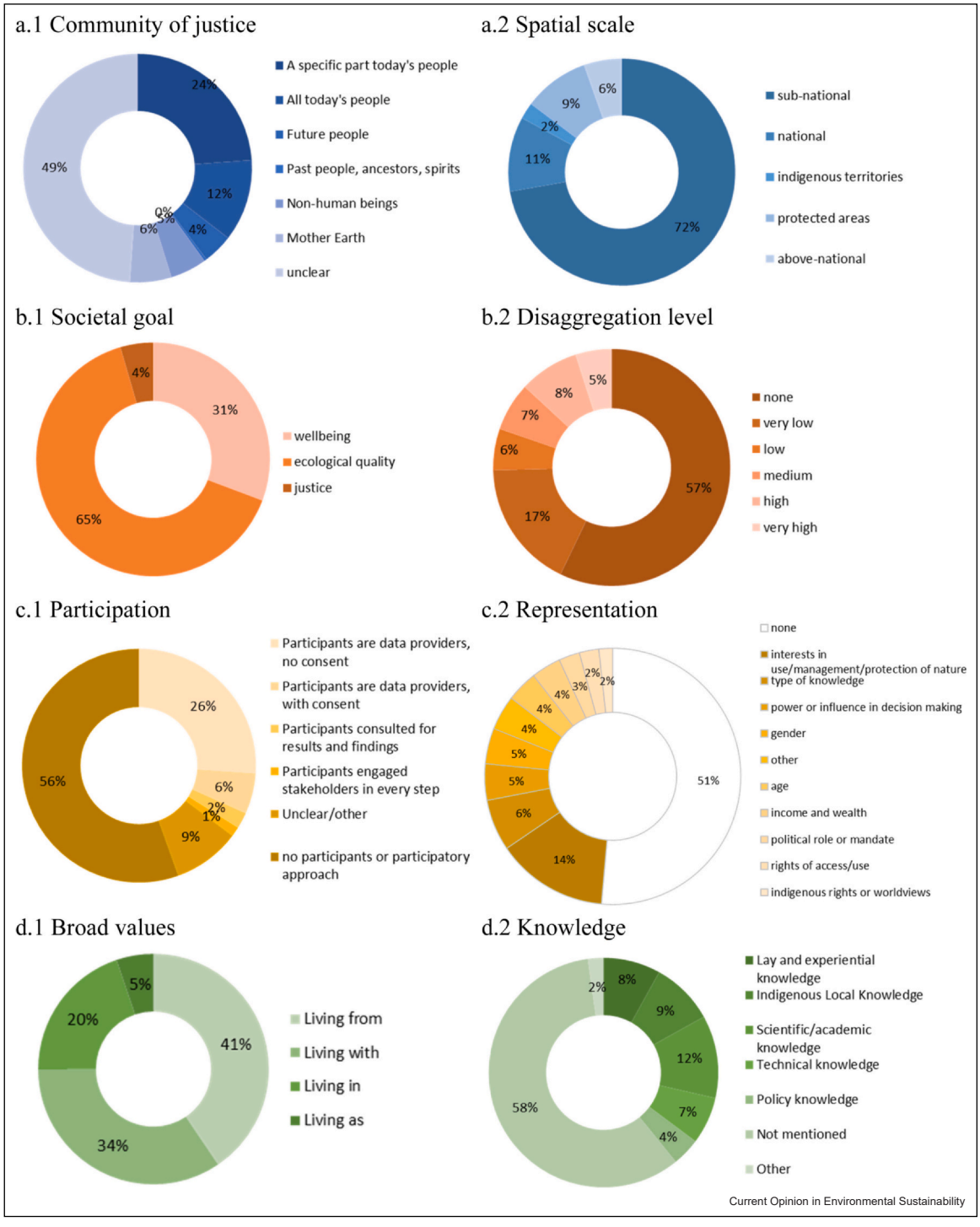
Community of justice

We find that most studies ignore a large part of the affected entities, and focus on a very small community of justice. In half of the reviewed studies, the community of justice is not identified explicitly in the papers, that is, it is not clear which human or other entity is considered entitled to moral consideration (Figure 1.a.1). The community of justice is rarely extended beyond humans, or beyond current generations by looking at the values of past or future generations, ancestors or spirits. This narrow focus in time also applies to the spatial (administrative) scale; most studies assess sub-national values (Figure 1.a.2) even though it is well-known that consequences of ecosystem changes may reach out far in time and space [5]. The literature is also biased towards high-income countries: 45% of the applications in the studies were conducted in high, 11% in low, 19% in lower middle and 26% in upper-middle-income countries — this distribution suggests that the overall literature pays insufficient attention to cross-border impacts of environmental change, and also underrepresents the values and knowledge systems of entire nations.

Distributive justice

Our results suggest that evidence for the consideration of distributive justice in the valuation literature is very scarce. Studies rarely explicitly focus on informing how justice as a primary societal objective is achieved (Figure 1.b.1). Studies assessing distributive outcomes primarily look at intragenerational justice by showing how values differ across stakeholder groups or space. Among the studies that assess human well-being, less than half analyse whether these values differ across stakeholder groups or by sociodemographic factors (gender, age, income and education) (Figure 1.b.2). It should be noted that our results provide no immediate evidence that those people or groups whose values are least often assessed in the literature are also those who bear the net losses of mismanagement; net losers cannot be reliably identified due to study design differences, missing baselines and incomparable disaggregation approaches (Figure 1.b.2).

Figure 1



Results of review on a subset of criteria for community of justice (a.1 and a.2), distributive justice (b.1 and b.2), procedural justice (c.1 and c.2) and recognition justice (d.1 and d.2). **(a.1):** 24% of the studies considers specific subgroups of the current human population, 12% for the current generation of people globally, 4% for future generations, 5% for non-human entities, <1% assessed past generations' values and 6% for mother earth. **(a.2)**: 72% of studies assess values in adminstrative areas at a sub-national scale; only 2% of studies take indigenous territories as their study area. **(b.1)**: About 4% of the studies focus on achieving distributive justice as a primary societal objective for the valuation study. **(b.2)**: 57% of the studies that assess human well-being do not disaggregate by stakeholder group or sociodemographic characteristics, whereas 5% (very high) analyses well-being along income, age, gender, education and stakeholder groups. **(c.1)**: 26% of studies did not ask for consent and only used participants as data providers; 6% only asked for consent; 2% shared findings; 1% involved participants throughout the valuation process. **(c.2)**: 51%

of studies did not involve human participants; 14% identified and targeted different social groups in terms of interests (14%), type of knowledge (6%), power (5%), gender (5%) or age (4%). **(d.1)**: 'living from nature' is the perspective reflected in 41% of studies, followed by the 'living with' (34%), 'living in' (20%), and 'living as' (5%) perspectives. **(d.2)**: 8% of studies included values held by the general public (lay/experiential knowledge); the majority (58%) do not mention the type of knowledge included in the valuation.

Procedural justice

The evaluation of procedural justice criteria suggests that, even though participatory and transdisciplinary research are on the rise, many studies do not actively involve human participants or take a participatory approach in the valuation process, such as studies that focus on the value of non-human aspects of ecosystems to assess individual organisms, biodiversity or biophysical processes (Figure 1.c.1). Noticeable is the lack of reporting on consent — in about a quarter of the studies with human participants, the participants were mere data providers. It also remains unclear how studies try to safeguard the inclusiveness of the valuation procedures; 88% of studies did not report on this, and approaches used are the bare minimum to collect data, such as using local languages (6%) and to adapting the communication media and channels (3%). In terms of transparency, most of the reviewed studies provide a general (49%) or detailed (41%) process description. However, only 3% of the studies share the data collection protocols and methods with their participants.

In general, participants rarely meaningfully participate and influence the valuation process or receive information about the findings of the valuation. The power imbalances in such participatory processes are hardly ever attended to: less than 1% of the studies mention that power asymmetries were present, and even fewer addressed these in the valuation process. This implies that the quality of the participatory processes in participatory studies cannot be evaluated.

Regarding representation, about half of the studies identify and target different social groups (Figure 1.c.2), based on either socio-economic characteristics or political role. Another half does not involve human participants at any stage of the valuation process, but uses other data such as documents or biophysical measurements. Only 19% of studies explicitly evaluate the representativeness of their participants. Of these, 10% provide information on the political representation, that is, of different stakeholder groups, whereas 7% evaluate the statistical representation of the sample, that is, in comparison with the total population of the study area.

Recognition justice

The valuation literature of the last decade is also still dominated by studies that focus on use and instrumental values, failing to recognise other ways of valuing and relating to nature. With respect to the assessment of broad values, 'living from nature' is the most commonly included perspective (41% of studies) (Figure 1.d.1), which is also reflected in the results for the different value classifications. Instrumental values of nature for human well-being are most frequently assessed (74% of valuation applications reviewed), compared with intrinsic values of nature (20%) and relational values (6%). This corresponds to findings for the TEV framework, where use values (direct in 47%, indirect in 25% of studies) dominate, followed by existence values (20%), whereas option (5%), altruistic (2%) and bequest values (1%) are rare.

Many studies (59%) fail to mention and recognise different types of knowledge, and another 12% are based only on scientific or academic expertise (Figure 1.d.2). This extends to guiding principles in many Indigenous Peoples' ways of life rooted in traditions of and notions of kinship, reciprocity, care and respect towards nature [15,25]. Indigenous People and Local Community (IPLC) knowledge systems and values are rarely recognised as legitimate, and also not adequately represented by non-indigenous valuation methods [23,48]. Only 9% of studies mentioned indigenous knowledge — and only 2% of studies were conducted in indigenous peoples' territories.

Across the studies reviewed, a wide range of value targets have been assessed, but — with the exception of some applications — individual studies tend to value single-value foci. Overall, the number of studies that addressed the different valuation targets (grouped into the dimensions of nature, NCP or quality of life) was comparable. In total, 78% of the studies in our database include fewer than five out of the 32 targets, and another 18% valued between six and 10 targets (18%).

Conclusions and recommendations

Our results show that valuation studies largely fail to address multiple environmental justice criteria. This practice likely limits its influence on justice considerations in policy instrument design [4,49,9]. If environmental valuation is to contribute not only to sustainable, but also to just futures, important transformations are needed in the way valuation is undertaken.

Increasing attention to environmental justice in valuation of nature, biodiversity and NCP will require an overhaul in the processes and focus of valuation studies, including a reallocation of efforts and resources, recognising that practical limitations can affect the quality of valuation studies. For participatory and transdisciplinary approaches, valuation practitioners will need to adopt new skills in managing and dealing with power relationships during the process of valuation, and study-commissioning bodies will need to adopt new, more inclusive approaches to decision-making. It also requires academia to embrace the complexity of inter- and transdisciplinary research and integrate social sciences into global change research [24]. Here, we provide recommendations for reducing injustices in valuation practice across justice's dimensions (see also Ref. [18]).

Community of justice

A first step in improving valuation efforts would be for every study to be explicit about whose values are targeted in the study (i.e. who is their community of justice?). This would entail applying interdisciplinary, social–ecological approaches [28,35] consisting of iterative stakeholder analyses to understand the diversity of actors involved, vulnerable groups, affected and affecting groups and differentiated powers to influence the outcomes [34]. To avoid reinforcing existing inequalities, the focus should go beyond distributive justice to ensure that procedural and recognition justice are upheld [20]. Distant and non-directly affected stakeholder groups, particularly in the Global South, should also be considered [31].

Distributive justice

Presenting and discussing inequities in the distributions of outcomes of different management options in valuation studies should be a priority, as this may enable decision-makers to design more equitable strategies, choose fairer interventions or implement compensation strategies. Approaches exist to show disaggregated results for the full community of justice of the study [10,47] or using various discount rates. Most are relatively simple and practical to implement, and — when adopted — would increase the visibility of inequitable outcomes. Making intergenerational distributive justice perspectives a required part of a valuation study would contribute to sustainability and justice [32], for example, by asking participants explicitly to consider the needs or rights of future generations, and evaluate the future impacts of their decisions.

Procedural justice

To increase the transformational power of valuation, a minimum requirement should be to strengthen transparency by more meaningful engagement of stakeholders in developing methodological protocols, generating the data and interpreting the results ([43] this SI). As such, valuation practitioners and commissioning bodies should promote transdisciplinary approaches [19] where stakeholders can have active roles in valuation. Reporting back the findings to participants (or making provisions for these feedbacks both in the project budgeting and timing) should be common practice. Adhering to minimum ethical guidelines (e.g. Free Prior and Informed Consent) is a low-hanging fruit, but more important is the use and evaluation of the implementation of best-practice guidelines for transdisciplinary approaches.

Recognition

The presence of plural values requires that practitioners involve multiple stakeholders holding different values, and embody multiple epistemologies and methods [2]. It is essential to consider adding methods to move from 'living from' worldviews towards assessing relational values and value frames of 'living in' and 'living as', associated with care, belonging, respect and reciprocity — where relevant in context. Such values are particularly entrenched in the values and knowledge of IPLC, and require IPLC approaches.

Data Availability

All data on which this perspective is based are available in the IPBES methodological assessment on diverse values and valuation of nature.

Declaration of Competing Interest

None.

Appendix A — evaluation criteria

Distributive justice	
The application	• Does not mention intragenerational justice-related aspects • Mentions but does not assess intragenerational justice-related aspects • Provides information or assesses intragenerational justice-related aspects • Unclear
The application	• Does not mention intergenerational justice-related aspects • Mentions but does not assess intergenerational justice-related aspects • Provides information or assesses intergenerational justice-related aspects • Unclear
Procedural justice	
The application deals with representation of different stakeholders and minorities	• Does not reflect on representation of the application of the method in its case study in results or discussion • Discussing and reflecting on who was included • Presenting results and data on representation (by showing no. of individuals and diversity of stakeholder groups, disparities etc.) • Unclear
The application included	• Diverse stakeholders groups (e.g. sectors, governance) • Binary gender (women, men) • Broader gender (women, men, LGTBQ +x) • Age class • Income/property class • IP and LC • Other minorities (e.g. disabled people)
Inclusiveness of participation: the application considers inclusiveness	• No features to ensure inclusive participation of different stakeholders • Allowing inclusive participation by accommodating the needs of different participants, for example, through the type of communication (verbal/written/visuals/otherwise, (extra) time, place, costs (compensation), child care, language(s) used, group composition and size) • Unclear/not mentioned
The study reports about participation level	• Does not reflect on participation level of the application of the method in its case study in results or discussion • Discussing participation level, for example, by reflecting on how different people, stakeholders and minorities participated, whether everybody was able to participate • Presents results and data on participation level
W.r.t. meaningful participation, the application	• Did not take a participatory approach • Only informed participants • Consulted participants as 'passive' data providers, without clear consent procedures • Consulted participants as 'passive' data providers, with clear consent (PFIC, GDPR) • Consulted and discussed results and findings with participants • Engaged stakeholders in every step, including question framing, method selection, results and conclusions and reporting • Other • Unclear
Power: the application	• Does not reflect on power dynamics of the application of the method in their case study in results or discussion • Discussing on power dynamics, for example, by reflecting on whether everybody was able to participate, and the existing power dynamics in the process • Presents results and data on power dynamics (by, e.g. showing speaking time, interruptions, use of physical space,..)
The application is transparent about the valuation process	• No info provided • General description on the process provided • Detailed descriptions provided in paper or supplements • Method's instruments (e.g. protocols and data collection material such as questionnaires) are shared with the general public and study participants in a way suitable for those groups and in line with ethics regulations • Method's proceedings documentation (e.g. notes about meetings, discussions, decisions and appeals) is shared with general public, stakeholders and study participants in a way suitable for those groups and in line with ethics regulations • Other • Unclear
Recognition justice	

(*continued*)

Recognition of broad values: presence of (diverse) life value frame-related terminology	Presence list checkboxes: living from nature: • Livelihood security • Human welfare and prosperity • Happiness • Responsibility (as sustainable use) • Intragenerational and intergenerational justice Living with nature: • Responsibility as respectful cohabitation • Coexistence • Care (supporting regeneration, reducing harm) • Protecting the environment • Stewardship • Rights of nature • Inter- and multispecies justice Living in nature: • Tradition • Enjoyment • Beauty and aesthetic experience • Inspiration • Health • Care (as maintenance, supporting regeneration and healing) • Awe • Belonging and rootedness • Bio-cultural diversity Living as nature: • Care • Reciprocity • Harmony with nature • Reciprocal responsibilities • Livelihood sovereignty • Spiritual sovereignty • Recognition justice • Respect • Responsibility and care for the land • Kinship and interpenetration with non-human persons • Self-determination	
The application is explicitly based on the following type of knowledge:	• Lay and experiential knowledge, held by consumers, citizens and general public • Indigenous local knowledge, held by Indigenous Peoples or like-minded community members or representatives • Scientific knowledge or academic expertise, held by academics or researchers • Technical knowledge, held by people in relevant professions (excl. academics) • Policy knowledge, held by policymakers, (excl. academics) • Other, namely…	
The application assesses the following 'targets of valuation'	Matrix checkboxes: Line 1: 'mentioned but not analysed'Line 2: 'explicitly analysed'	
	Value target	Value focus
	Individual organisms	Individual organisms
	Biophysical assemblages	Biophysical assemblages
	Biophysical processes	Biophysical processes
	Biodiversity	Biodiversity
	Maintenance of options	Options for NCP
	Habitat creation and maintenance	Regulating NCP
	Pollination and dispersal of seeds and other propagules	Regulating NCP
	Regulation of air quality	Regulating NCP
	Regulation of climate	Regulating NCP
	Regulation of ocean acidification	Regulating NCP
	Regulation of freshwater quantity, flow and timing	Regulating NCP
	Regulation of freshwater and coastal water quality	Regulating NCP
	Formation, protection and decontamination of soils and sediments	Regulating NCP
	Regulation of hazards and extreme events	Regulating NCP
	Regulation of organisms detrimental to humans	Regulating NCP

(*continued*)

	Energy	Material NCP
	Food and feed	Material NCP
	Materials	Material NCP
	Medicinal, biochemical and genetic resources	Material NCP
	Learning and inspiration	Non-material NCP
	Physical and psychological experiences	Non-material NCP
	Supporting identities	Non-material NCP
	Living well in harmony with nature	Cultural
	Identity and autonomy	Cultural
	Spirituality and religions	Cultural
	Art and cultural heritage	Cultural
	Sustainability and resilience	Societal
	Diversity and options	Societal
	Governance and justice	Societal
	Health and well-being	Individual
	Education and knowledge	Individual
	Good social relations	Individual
	Security and livelihoods	Individual
The application assesses the following 'types of economic values':	Matrix checkboxes: Line 1: 'mentioned but not analysed'Line 2: 'explicitly analysed'Columns: • Use values: direct use: consumptive (e.g. crops, livestock and aquaculture —provisioning ES) • Use values: direct use: non-consumptive (e.g. recreation, spiritual/cultural well-being and education — cultural ES) • Use values: indirect use (e.g. pest control, pollination and soil fertility — often regulating ES) • Option values (future use of known and unknown benefits) • Non-use values: philanthropic: bequest value (e.g. satisfaction of knowing future generation's benefits) • Non-use values: philanthropic: altruistic value (e.g. satisfaction of knowing other people's benefits) • Non-use values: biodiversity: existence value (e.g. satisfaction of knowing that species/ecosystem exists)	
The application has the following 'justification of valuation'	• Emphasis on instrumental values (monetary and non-monetary), also reference to life-support values (fundamental relational values) of processes that support human existence and prosperity as well as to some eudaimonic relational values (sustaining environmental resources that contribute to happy and prosperous human lives) • Emphasis on intrinsic values (inherent worth, dignity of nonhuman beings as well as non-instrumental values), life-support values (fundamental–relational) of processes that support the existence and flourishing of nonhuman beings and some eudaimonic relational values (sustaining a good because of a virtuous and fulfilled human life) • Emphasis on eudaimonic (sustaining a good because meaningful, aesthetic and non-alienated human life) and constitutive relational values (essential components of human identity, practices and cultural meanings)[a] • Emphasis on constitutive relational values (relations that constitute who people and communities of human and nonhuman beings are), intrinsic values from a non-dualistic perspective (e.g. as related to the agency of all life) and eudaimonic values (sustaining nature because of an interdependent life)[a]	
Based on the above verifiers, who are the subjects of the Community of justice: the application takes into account distribution, inclusion, representation and recognition (multiple possible)	• A specific part of the current people • All current people • Future people • Past people, ancestors • Non-human beings • Mother earth • The study does not look at justice towards anything or anyone	

[a]In the review, the two different types of relational values were merged as the papers did not allow for a clear identification of either of the types.

Appendix B — selection of reviewed papers

To begin with, published nature valuation studies were identified through searches in Web of Science (see [41] for the method). The abundance of valuation studies over global regions and through time resulted in a georeferenced database of 48 329 publications. From this database, a random sample was drawn of 3128 papers published between 2010 and 2020, stratified over four method families (see [42] for details) and four IPBES regions, for the in-depth systematic review. Papers that did not mention to report on valuation applications in their title or abstract were discarded. Next, the full content of these articles was reviewed according to a large set of questions, including justice aspects. Where papers presented multiple case studies or method applications, these were scored as separate valuation applications unless they were combined to inform decision-making. Papers that did not report the results from the valuation were discarded. This left 1163 studies of relevance.

Appendix C — list of methods included in the database

- Big data methods
- Biophysical and biodiversity assessments
- Choice experiments
- Conceptual models
- Contingent valuation
- Correlative analysis
- Cost-based methods
- Cost–benefit analysis
- Cost-effectiveness/benefit ratio analysis
- Deliberative valuation method
- Document analysis
- Economic (other)
- ES modelling and valuation
- Ethnology-based approach
- Focus groups/expert workshops
- Hedonic valuation method
- Integrated modelling (others)
- Integrated valuation
- Integrated valuation (other)
- Interviews
- Mapping
- Market prices
- Modelling interlinkages
- Multicriteria decision analysis
- Non-participant observation
- Participant observation
- Participatory (other)
- Participatory mapping
- Participatory rural appraisal
- Photo-elicitation
- Preference assessment (other)
- Production function method
- Q-methodology
- Questionnaires
- Revealed rreference (other)
- Scenarios
- Spatial correlative analysis
- Stated preferences (other)
- Storytelling/oral tradition (elder's interpretation)
- Structured expert elicitation
- Transfer approach

- Travel cost
- Well-being indicators

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- • of special interest
- •• of outstanding interest.

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This paper evaluates how different valuation methods could in theory perform on plural valuation, emphasizing issues of power, inclusion, and recognition.

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Current Opinion in Environmental Sustainability

Five steps towards transformative valuation of nature

Mette Termansen[1], Sander Jacobs[2], Ram Pandit[3,4], Tuyeni H. Mwampamba[5,6], Nicolas Dendoncker[7], Marije Schaafsma[8], Victoria Contreras[5], Davide González-Jiménez[5], Haripriya Gundimeda[9], Heera Lee[10,11], Anna Filyushkina[12,13], Mariaelena Huambachano[14], Ignacio Palomo[15] and Antonio J. Castro[16]

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

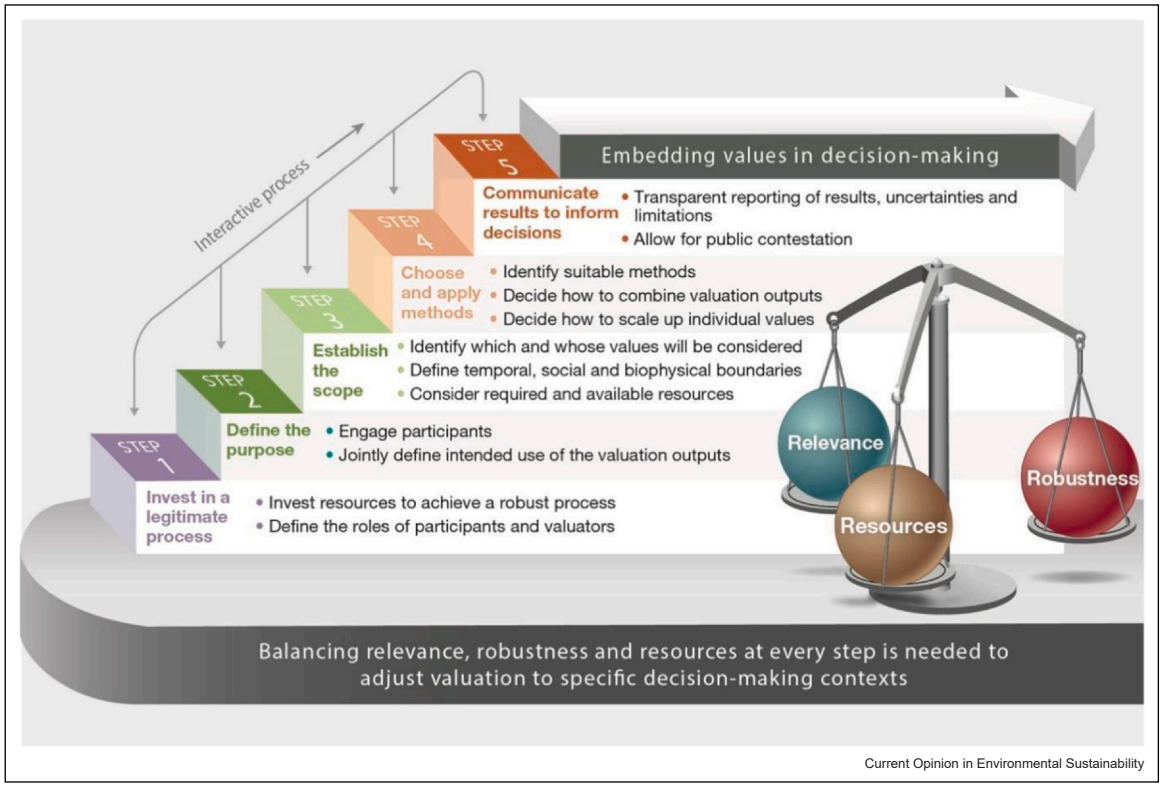
Below, we describe the proposed 5-step procedure illustrated in Figure 1.

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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The pitfalls of plural valuation

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This paper critically examines the current political context in which valuation studies of nature are undertaken. It challenges the belief that somehow, more and technically better valuation will drive the societal change toward more just and sustainable futures. Instead, we argue that current and proposed valuation practices risk to continue to overrepresent the values of those who hold power and dominate the valuation space, and to perpetuate the discrimination of the views and values of nondominant stakeholders. In tackling this politically sensitive issue, we define a political typology of valuations, making explicit the roles of power and discrimination. This is done to provide valuation professionals and other actors with a simple framework to determine if valuation actions and activities are constructive, inclusive, resolve injustices and enable systemic change, or rather entrench the status quo or aggravate existing injustices. The objective is to buttress actors in their decisions to support, accept, improve, oppose, or reject such valuations.

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Introduction

The recently approved methodological assessment of the diverse values and valuation of nature the intergovernemental science-[1] has ushered momentum for a new, plural way to perform valuations to contribute to global sustainability and justice goals [2]. Valuation of nature is defined as "*a process which is consciously undertaken to generate information on values* [*of nature and nature-human relations*], *to support* [*often collective*] *decisions*", which goes beyond valuation as defined or realized within specific disciplines or traditions. The Summary for Policymakers [3] provides constructive, action-oriented, and optimistic pathways for considering diverse values in decisions about nature, and addressing injustices in terms of whose values are

advanced or ignored. However, behind our feeling of common achievement, we share a growing concern that these goals cannot be achieved through technical improvements or simply by considering more diverse values, but requires addressing the political aspects that influence how power and exclusion *affect* valuation of nature. If valuation is to leverage transformative change, recognizing plural values alone might not be sufficient, or even counterproductive, if deeper leverage points [4] are not adequately addressed. We argue that in many cases, undertaking a valuation study may not be the best idea. By providing examples and a simple framework to critically assess the power balance within a given valuation context and by pointing out diverse options to take position with or against valuations, we hope to counter depoliticization of the valuation debate. Assessments, especially when labeled 'methodological' such as the intergovernemental science-policy platform on biodiversity and ecosystem services (IPBES) VA, tend to follow a linear model and render the politics of science implicit [5]. The emphasis of particular technical knowledge over other forms of knowledge is an unacknowledged political act [6,7] that circumscribes what solutions are promoted at the science-policy interface by, for instance, IPBES and Intergovernmental Panel on Climate Change [8,9]. This implicit politics of assessment is accompanied by a risk that more explicit political requirements are also unexamined [10], for example, if 'more valuation' is intended to achieve empowerment of marginalized groups, it will require explicit political agendas to disrupt rather than reinforce existing knowledge and power hierarchies.

This paper takes stock from the collective learning within the IPBES Values assessment and presents some critical points regarding current valuation practices, to (re)open the debate on some of the more politically sensitive issues, such as who dominates and whose values are (over)represented in the valuation process (see also Ref. [11]) These questions are inherent to real-life political contexts in which valuation occurs [12] and resonate with environmental injustices increasingly reported globally [13,14]. While issues of power and conflicts were already raised by the IPBES VA, they remain underemphasized in the summary for policymakers, due to the political nature of negotiating this text among 139 member governments. There is, in fact, very little evidence on *actual positive impact* of valuations on decisions — let alone on sustainability — [15], while evidence on the *risks* of valuation (i.e. the failure to incorporate the full diversity of values, and the distraction from actual political strategies) abounds in all valuation disciplines [16]. Therefore, in this reflection paper, we seek to repoliticize valuation by (a) deconstructing the pragmatic — and sometimes naive — narrative around valuation, which implies that 'more and better' valuation will spur societal transformative change, and (b) offering some critical examples, reflection, and a simple framework to help various actors define their position toward a given valuation. To this end, we first introduce a political typology of valuation along dimensions of power and discrimination (Section *The hidden politics of valuation: some typical examples*). Then, we discuss which conditions should be met for valuation to improve sustainability (Section *Valuation as an instrument of oppression and depoliticization*) and point to limitations of the plural valuation discourse (Section *The plural valuation band-aid*). Finally, we conclude by defining how one's positionality toward a given valuation offers different avenues to tackle injustice in/of a given valuation, hereby highlighting that each valuation choice — even technical — has political consequences.

The hidden politics of valuation: some typical examples

The ways in which valuations are applied politically are diverse. Without providing an exhaustive overview, we focus on a few typical examples of the many ways in which power imbalances and self-interest percolate through the complex mechanism of valuation of nature. While this remains an unexplored field of study and an area of awareness-raising, we offer some intuitive examples and provide real-life cases for each of those mechanisms. The examples run horizontally through economic, noneconomic, or other disciplinary classifications of valuation. Even if some of these problems are mentioned in the literature as issues of a certain discipline (mostly outside of the authors' field), they actually emerge from the actors' political purposes and strategies, and can be found throughout various valuation methodologies and scientific disciplines and traditions.

Discriminative valuation is one of the more obvious examples: powerful actors produce a valuation directly in their own interest and use this as a power lever to trump other actors' interests and values. Typical examples occur when economic cost–benefit arguments or Environmental Impact Assessment (EIA) are used by companies to coerce governments for destruction of natural areas without involving affected stakeholders and not-clearly stating tradeoffs for the environment. One of many examples is the poor EIA performed by Nigerian oil industries to satisfy regulatory requirements for obtaining environmental permits [17]. Other examples are found in deliberative processes with overrepresentation of powerful or privileged social groups [18].

Appropriative valuation is an example of a more devious version of the former. In slightly less authoritarian contexts, valuation processes are set up to be more

participatory, representative, and/or inclusive, but in the end, a powerful minority uses these qualities to push for an outcome that advances their private benefits. Examples are the application of tokenism-participatory processes in urban planning or rural appraisal, or the application of concepts such as ecosystem services while not accounting for locally specific values or values that do not fit an ecosystem service category [19], or concrete cases such as the efforts to incorporate indigenous knowledge in buffalo restoration projects in North America, which involved soliciting details of relational valuation based on kinship. But in the absence of a political agenda to restore control over territories, this move to incorporate relational values fails to support indigenous empowerment and is considered manipulative because it exploits the assessment of values to reinforce the case for ecologists' case for species reintroduction [20].

Repressive valuation exemplifies a partly overlapping strategy. Openly repressive valuations serve to offensively discredit or dismiss legitimate claims of opposing actors (e.g. with arguments such as 'actor subjective perceptions' versus 'expert facts', such as the fracking industry in the Marcellus shale region in the United States, which framed natural gas development to the general public in a positive light of patriotism and environmental sustainability while framing those against the project as irrational obstructionists) [21]. More covertly repressive valuations also occur, for instance, when engaging the (potentially) opposing actors, thereby utilizing their time, energy, and buy-in otherwise available for opposition, while their concerns are not or only partly integrated, such as several cases of public participation in climate policy [22].

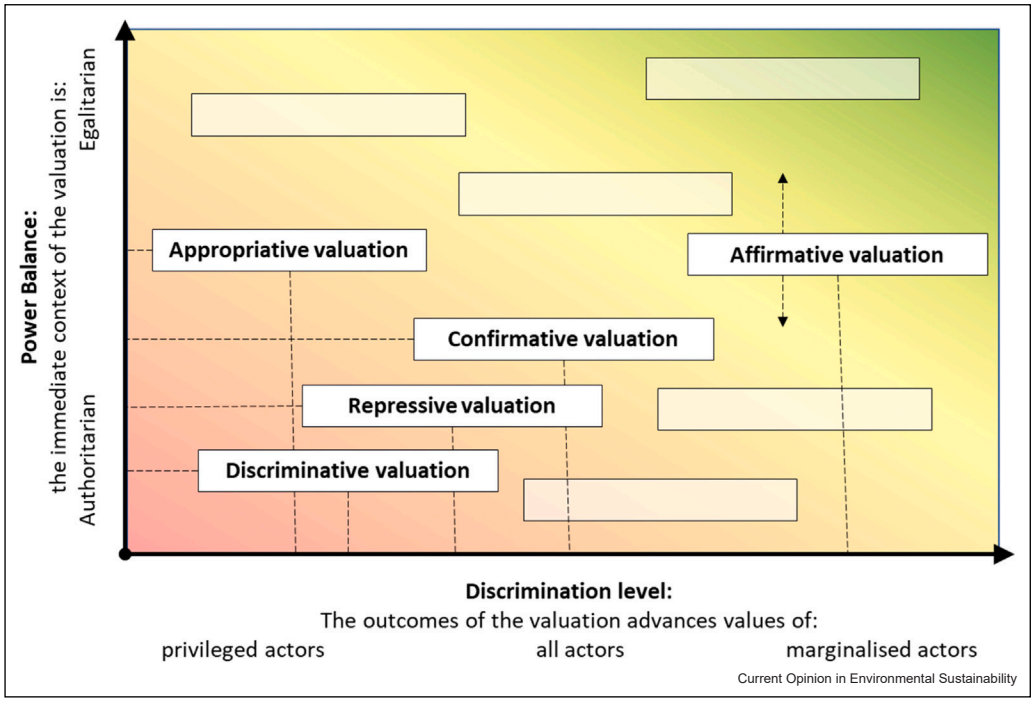
Confirmative valuation takes place in a more balanced power context, and brings a more diverse set of values from different actors to the decision table. However, it does not transform anything in the sense that such valuations will confirm, reproduce, and perpetuate existing imbalances and the status quo of vested interest. While this seems a more 'just' valuation compared with the former types, its reactionary potential lies in perpetuating the belief that equality (all actors get the same regardless of their starting position) always suffices to obtain equity (weaker actors get more, stronger actors less, to level the playing field) [23]. Moreover, confirmative valuation is often applied to justify decisions already taken, and build credibility and acceptance within broader actor groups, such as the inclusion of multiple actors and values in decision processes on greenhouse expansion in Almeria, Spain, which then revert to unsustainable scenarios [24,25]. Another very common valuation type that could be described as 'commissioned-but-then-ignored', exemplified by the lack of reported uptake of valuation studies ([14], see also Ref. [26]), might also fit this category.

Affirmative valuation is an example of a valuation that actively counterbalances injustices built into history, place, and social arrangements. It exists in authoritative as well as egalitarian contexts, and is often initiated and implemented by discriminated groups and/or their allies, as these valuations depart from an equitable representation, meaning that they mostly advance those actors who are less privileged and vice versa, instead of treating all actors as if they have equal privilege. For instance, Ecuadorian plaintiffs from the Ecuadorian Amazon filed a class action lawsuit on behalf of some 30.000 Amazon inhabitants against Texaco for environmental and social damage, forcing the company to economically compensate the affected communities [27].

With these explorative examples of the politics behind valuation, we aim to demonstrate that power imbalance and discrimination impacts (intended, unintended, positive, or negative) can be made explicit. Using such explicit qualifiers of valuation politics (e.g. manipulative, coercive, enlightened, contestative, transformative, corrective, and valuations), might help to assess valuations already accomplished, or stimulate reflection and contestation of particular valuation practices. In very broad terms, valuations can be organized along two theoretical axes: the power balance within the process and the discrimination impact of the outcomes. The political complexity of valuation contexts evidently includes spatial and temporal scales, a diversity of power configurations, and reasons for discrimination and intersectionality, yet these two axes provide an accessible, intuitive framework to spur discussion and critical reflection without the need for deep understanding of political ecology. Figure 1 positions the examples above along these gradients, and recognizes the existence of many more political examples (empty boxes in Figure 1).

The power balance of the valuation context reflects the varying ability of actors to affect decisions and actions in the immediate context surrounding the valuation. By 'immediate context of the valuation', we mean all the actors directly affected by/involved in the valuation, including its commissioning, funding, execution, and communication [28]. Power comes in many forms, and can be organized in several types such as instrumental (referring to one's direct power over another), structural (determines what actionable options make it to the agenda), and discursive (determines what options people are likely to consider) ([29], see also Ref. [11]). In its simplest form, the power dimension (y-axis in Figure 1) starts from a highly skewed distribution of power at the lowest point on this axis, where a single non-representative group holds power within a society or

Figure 1



A few typical examples of the politics of valuations in a power balance/discrimination-level plane. Each of these have a specific way of how the power imbalance produces discrimination, either unintended or deliberate, either invisibly or obviously. The empty boxes emphasize that many other examples of valuation politics are still to be described (see text).

collective (i.e. 'authoritarian'). Consequently, the scope and narrative of a valuation, the selection of methods, quality criteria, and available resources are determined by a privileged few. Shifting higher along the Y-axis, power becomes more evenly distributed among all relevant actors, leading to increasingly more balanced influence on valuation choices and criteria (i.e. more 'egalitarian'). Note that power balance within a group or collective can differ from the 'overarching' power structure. For example, a general assembly-based municipality can exist within a dictatorial state as well as an authoritarian workfloor situation can exist in a predominantly democratic context.

The discrimination level of the valuation outcome (x-axis in Figure 1) reflects the extent to which the values held by diverse actors are excluded or included in the decisions based on the valuation (see also Ref. [30]). Such value expression and oppression can operate along gender, cultural, spatial, and knowledge-type lines, and extend to nonhuman actors, future generations, and nature itself. At the lowest level of the discrimination axis (y-intercept in Figure 1), only the values of a small group of the privileged are reflected in the decisions, with the majority of other values oppressed. Moving away from the y-intercept, more diverse values of the whole of society are reflected in decisions. Continuing even further to the right on the x-axis, marginal or discriminated groups' values are more strongly represented in the decisions. However, valuations might reflect diverse values in their out*puts*, but the decisions made on the basis of these outputs, that is, the out*comes*, may still serve only the values of the powerful few, if in the valuation context there are only changes in the discursive power (what is being valued) but not in the instrumental or structural power (who determines the decision space and makes decisions).

Valuation as an instrument of oppression and depoliticization

Valuation practices are not introduced into neutral social arrangements but are implemented in existing ways of governing conservation and restoration of nature. Existing governance systems are diverse, providing considerable differences in the extent to which actors can control decisions that affect their lives [31]. For instance, conservation interventions that involve local leadership and empowerment have been linked to better social and ecological outcomes [32–34]. But, good social arrangements — on any scale — are unlikely to be produced through 'more valuation', on the contrary, valuation can distract from the real political motivations behind a decision. Proponents of plural valuation need to be aware that these conditions need to be actively

developed first for valuation to meet justice and sustainability goals instead of perpetuating or aggravating existing environmental injustices. Some crucial questions to address are: how to actively form these governance conditions? Is that meaningful within a valuation project context [35]? Who should take responsibility for this? And how discriminatory are the thresholds to engage in/with the valuation?

Indeed, the capacity to conduct valuation and to act upon the results of valuation was found to be highly uneven not just across different regions of the world, but also across different actors [36]. This capacity is a multidimensional concept that includes not just the technical capacity but also the ability to bridge across knowledge domains, to represent someone's own value perspective, to trust others and respect their choices, or to develop an inner motivation to act upon such diversity of perspectives [37,38]. Co-developing such capacities at the societal level is one of the main external conditions to obtain valuations that effectively move toward justice and sustainability [39]. It is critical to realize that each actor has something to share and learn from, being this the traditional knowledge of local actors, the methodological and analytical advancements achieved by scientists, the power of enactment and law enforcement of policymakers, or the motivation to struggle and bring transparency to politicized issues of political actors. Combining and improving these existing capacities through bridging, negotiation, networking, and sometimes conflict helps develop shared interests, and brings marginalized social groups to the center as capable actors (see also Ref. [40]).

The plural valuation band-aid

In an optimistic response to this, plural valuation proposes to include more diverse values and stakeholders. This is essentially an avenue in the much bigger field of participation in environmental decision-making [41]. This body of scholarship identifies multiple benefits from inclusion: justice benefits arise from meeting people's rights to recognition and to influence decisions that are salient to their well-being; instrumental benefits facilitate conservation effectiveness, for example, through increased buy-in and reduced conflict; substantive and constructive benefits involve improved outcomes arising from better — more diverse — knowledge and learning [42,43]. But studies of participation also highlight massive gaps between rhetoric and reality, pertaining to our arguments to recognize and better understand particular risks associated with naive valuation agendas. The challenges are wide-ranging, many of them technical (whose values to include, how, where, when, etc.) but are mostly underpinned by issues of power [44]. A naive participatory agenda assumes that more diverse valuation is a means of empowerment of marginalized groups. But power pervades society in governance arrangements, discourse, knowledge systems, choice of valuation methods, and so on [45]. Within science-policy processes such as IPBES, the turn to 'co-production' is a form of participation that recognizes the need to diversify knowledge but may often fail to achieve empowerment due to pervasive power inequalities [10]. Attempts at participation that are naive to power can be perverse, potentially producing a valuation discourse that renders the causes of oppression invisible, and co-opts communities into supporting these.

Many — if not most — environmental conflicts and injustices require urgent action to prevent further permanent damage or escalation. This makes plural valuation a risky choice. Even if the necessary capacities are developed and conditions fulfilled, and a plural valuation could be realized, the question remains whether this is an effective use of time, capacities, and resources. The longer a valuation takes, the higher the chance that outputs come too late, and irreversible decisions or actions on the ground are taken. Moreover, in case the valuation is ignored or overruled by decisions, the spent time and resources are wasted and the valuation can be perceived as appropriative or even (covertly) repressive, whether intended to or not.

Even when dealing with a valuation within its 'safe operating space' [14], there are structural risks and dilemmas involved, regardless of the valuation type. For instance, cooptation can occur in affirmative-type approaches, when these are met with skewed power structures and end up with a valuation that only co-opts the marginalized groups instead of empowering them to act upon their values. Self-exclusion can occur when attempting an affirmative valuation, trying to engage and give voice to marginalized groups, but when these groups refuse to collaborate (e.g. because of feeling co-opted, earlier bad experiences, lack of trust in the system, or lack of capacities), the valuation ends up as being confirmative or appropriative. Also, the understanding of 'marginalized' is a question for reflection, as a group that is globally privileged might be discriminated against in a local context or vice versa. This is especially tricky when actors claim their discrimination as a means of wielding power.

Conclusion: making strategic and moral choices

In a world where environmental conflicts abound, it often only takes the ancient question '*cui bono*' — who benefits — to clearly demonstrate obvious injustices. In many — if not most — environmental conflicts, the first concern is to build capacity for political, legal, or extra-legal processes (see Ref. [35]) rather than advocating for plural valuation and complex analysis. As an actor involved in (or affected by) a valuation, the options are to

collaborate, critically influence, transform, reclaim, resist, or contest a valuation. As a valuation practitioner, the option exists to refuse collaboration with appropriative, repressive, or discriminative valuations. Similarly, one can choose to critically challenge confirmative valuations from within or outside, to support or initiate affirmative valuations, or to switch to other political strategies altogether. For decision-makers who commission, interpret, or assess valuations, it is important to be aware that even well-intended valuations might not lead to legitimate, inclusive, or acceptable outcomes, and that resistance is to be expected when actors are confronted with injustice.

Note that all of the concerns mentioned here go beyond mere 'valuation of nature' as defined in the IPBES assessment on diverse values and valuation and pertain to broader processes of collective knowledge generation, deliberation, and decision-making.

Our conclusions also challenge institutions such as IPBES to reflect on the implicit politics of knowledge coproduction: what is the position of their assessments — that are essentially large, global valuations — in the global political arena? Are all legitimate voices being included in the assessment processes? Are dominant epistemologies disrupted or reinforced? What are the consequences of resource allocation choices between conducting assessments and supporting capacity-building? What is their commitment to (self-) transformation, equity, and affirmative action? What would be the most effective contribution to actual transformative change? In particular, the intention and scope of some 'methodological' IPBES initiatives such as the transformative change assessment and the nature futures framework would deserve some critical reflection in that sense.

With these reflections originating from the IPBES Values assessment, we hope to reopen the debate on the hidden power dynamics, inequitable distribution of benefits and burdens, and the actual political purpose nested within valuations of nature. Understanding these political intentions and power dynamics is a critical step toward making valuations transparent, visualizing contrasting values, and making political agendas explicit. Continuing naive valuation will lead to pervasive outcomes, regardless of their (communicated) intentions. Our simple recommendation — to practice, policy, and research alike — is to be critically aware of the actual political context in which a valuation is undertaken. It is essential to consider the 'why' *before* the 'how'.

Data Availability

All data on which this perspective is based are available in the IPBES methodological assessment on diverse values and valuation of nature.

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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Papers of particular interest, published within the period of review, have been highlighted as:

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- •• of outstanding interest

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The values assessment is a 'methodological assessment regarding the diverse conceptualizations of the multiple values of nature and its benefits, including biodiversity and ecosystem services' as set out in IPBES/6/INF/9. The overall scope of the values assessment is to assess multiple sources and traditions of knowledge regarding diverse values of nature, including the strengths and weaknesses associated with existing valuation methods and approaches to make such values visible. The assessment provides conceptual and practical tools to aid policymakers in the recognition and accounting of nature's values in different decision-making contexts. The values assessment provides guidelines, criteria, tools, and a road map to navigate the ways in which values play out in decisions, as well as the role values and valuation, can have in achieving more sustainable pathways. It should be noted that the assessment does not provide quantifications (e.g. in monetary or other indicators) of the diverse values of nature across the globe, as its emphasis is on methodologies.

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This chapter links diverse values of nature as communicated through different value articulation (' valuing ' and valuation) processes to decision-making and its outcomes. It reviews the underlying causes of treating impacts on nature as external to, and ignored in, decisions by current political, economic, and socio-cultural actors and institutions (i.e. conventions, norms, and rules) and describes how on-the-ground drivers of nature's decline can be transformed towards recovery, focusing on land and sea use. The modalities and practice of explicit valuation of nature (preceding chapter) in support of decisions, and the decision-making processes themselves, may need to evolve further to achieve global sustainability goals, the CBD 2050 vision of living in harmony with nature, and the recent Kunming Declaration of the CBD.

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The primary objective of this chapter is to identify key considerations for making valuation choices and developing guidance for improving valuation practice. To this end, the chapter synthesizes existing knowledge on valuation methods in order to identify the range of valuations that exist, how they have been applied, and what their limitations are. The chapter assesses the potential of valuation methods to elicit and make sense of diverse values.

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The overarching objective of Chapter 6 is to provide options which enable a system wide transformation towards just and sustainable futures by incorporating nature's diverse values in decisions made by diverse actors. Four specific goals have been identified as part of this overall objective: (1) to assess how the values of nature are incorporated in policy instruments, in valuations supported by decisions, and in biodiversity-related initiatives, (2) to identify policy options within and across sectors that engage with diverse values of nature for transformative change, (3) to highlight existing gaps and challenges and identify capacity development needs and options, and (4) to guide the operationalization of nature's diverse values in decision-making {6.5}.

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Current Opinion in Environmental Sustainability

Signposts on the road toward transformative governance: how a stronger focus on diverse values can enhance environmental policies

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Transformative change toward sustainability is increasingly recognized as inevitable to avoid the collapse of socio-ecological systems. However, for a deep and system-wide transformation, governance approaches and policymaking need to be changed too. This paper discusses how a diverse value approach in environmental policymaking could be undertaken to foster transformative governance that can further lead to system-wide transitions. Based on the analysis of different policy options' transformative potential, we argue that the more diverse values addressed by a policy instrument, the bigger its transformative potential. Weaving values into policy decision-making is possible at several junctures of the policy process, but context-specificities should always be considered, and capacities must be enhanced at all levels, both for public and private actors.

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This review comes from a themed issue on **Values for transformative change: The IPBES approach**

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Introduction

Moving toward just and sustainable futures has found more acceptance across a broad range of stakeholders [1], partly catalyzed by the COVID-19 pandemic [2,3]. The need to overcome inequities within societies also became apparent to ensure the Agenda 2030 mandate of '*no one is left behind*'. The urgency to transit toward sustainable futures has been emphasized in various assessments [4–6]. These indicate that a 'transformative change' toward sustainability is required, implying radical and system-wide changes to the way we operate politically, economically, and socially, as well as in our interactions with nature [4,5,7].

Governance has a critical role to play in transformative change by creating enabling conditions that make room for systemic changes to emerge and by stimulating and leading the transformative processes. These enabling conditions often emerge when governance regimes themselves are transformed [8]. The Intergovernmental Science-Policy Platform on Biodiversity and Ecosystem Services (IPBES) Values Assessment also identified the values-centered

reforming of policies, rights, and regulations as a key leverage point toward transformative change [9]. Supporting transformation through improved governance requires acknowledging the multitude of actors involved in every decision related to nature. All those actors value nature implicitly according to their worldviews and knowledge systems, which influences the broad and specific values they hold toward nature, and further informs their motivations and behavior [10]. Embracing this diversity of nature's values in decision-making is necessary but challenging [11].

This paper shares some of the main findings of Chapter 6 of the IPBES Values Assessment, which focused on policy options and capacities for operationalizing the diverse values of nature in decisions [12]. It seeks to highlight how perspectives of multiple actors in a decision process manifest in different policy outcomes, and how they reconcile with different capacities. To achieve these objectives, the paper first briefly summarizes the main features of transformative governance, and then uses these features to assess the transformative potential of currently used environmental policy instruments. Based on the main findings, suggestions are made on how to open up policymaking and strengthen capacities to better operationalize the diverse values of nature in decisions.

Transformative governance and values

Transformative governance is the approach to govern transformative change that enables "*the capacity to respond to, manage, and trigger regime shifts in coupled socio-ecological systems at multiple scales*" [13]. Positive transformations in the governance of socio-ecological systems are more likely to happen via internalizing diverse values rather than a singular view [14]. Transformative governance can internalize a values-centered approach by diversifying the range of values, by coproducing values of nature, by institutionalizing values at different scales, and by acknowledging various levels of societal change [9]. This implies that decision-makers need to carefully consider whose values and worldviews are represented and acted upon in decision-making through a holistic approach [15,16].

Although a unified theoretical framework on transformative governance has not yet emerged, five features can be identified in the growing body of literature, which can signal the transformative potential of different policy options:

- Addressing the *status quo*. Promoting a transformative governance would require addressing existing drivers — that is, the harmful policies and their value contexts — in the society and institutions that contribute to the decline of the environment [14,17,18].
- Incorporating diverse values. The notion that diverse values can function as leverage points for sustainability transformations has been gradually embraced by research and policy communities [19,20], particularly through dialogs, colearning, and knowledge coproduction with marginalized groups holding strong sustainability values [4,16].
- Fostering institutional change. Enhancing the existing social and institutional networks through diverse values can help overcome the policy deadlocks that prevent sustainability transitions [21]. This way, institutional restructuring can induce changes in behavior, values, and culture [22,23].
- Building on multiple actors' capacities. Transformation toward sustainability requires all relevant actors (including people from across different cultures, languages, knowledge systems, gender, ethnicity or age groups, etc.) to be able to assess information about diverse values and use this information to induce change [24]. To weave diverse values into governance, capacities for reconciliation and negotiation through collaborative approaches are needed [25,26].
- Supporting integrative–adaptive governance. Sustainability goals are complex, uncertain, and constantly moving, so governance needs to allow continuous learning, experimentation, reflexivity, and feedback [3,27]. The integrative–adaptive approach would help to ensure that local solutions also have sustainable impacts at other scales and sectors [16].

In recent years, attempts have been made to induce policy reforms either by launching new, innovative environmental policies, or by remedying harmful instruments. We assume that policy options can have a higher transformative potential if they show the above characteristics in their design and implementation. This assumption is examined in the next section.

Policy options toward values-centered transformation

Policy options can be understood as tailor-made combinations of policy support tools and instruments [28], applied in specific contexts and at given scales. A meta-analysis of 37 environmental policy instruments was carried out using the core text and Annexes of Chapter 6 of the IPBES Global Assessment [12]. The list of policy instruments was derived from the IPBES Catalogue of Policy Instruments and Policy Support Tools [29], including: 1) economic and financial instruments, 2) legal and regulatory instruments, 3) rights-based instruments and customary norms, and 4) social and cultural instruments.[2] During the analysis, a database was created,

[2] Please note that this assessment focused on environmental policy tools, which by design, aim to address biodiversity loss and its underlying direct and indirect drivers. As a consequence, this paper does not address in detail the interplay between environmental policies and other mainstream policy fields (e.g. energy, mining, defense, or trade), which often have (un)intended negative impacts on nature. An important limitation of this paper is thus the superficial reflection on clashing interests and power battles across different policy arenas.

including textual explanation of the main features of each policy instrument (e.g. how and at which scale it is used, its reported benefits and limitations, etc.). Then, the transformative potential of each instrument was assessed along five criteria derived from the main characteristics of transformative governance (for methodological details see Appendix). Furthermore, 62 peer-reviewed papers presenting policy uptake of valuation results, and 43 case studies on international initiatives supporting environmental policy application, were assessed to learn about practical implementation.

Integrative and adaptive policy options that weave diverse values and promote capacities — and therefore demonstrate transformative potential — were found in all four types of policy instruments, although the strengths and weaknesses differed across the four instrument types (Table 1). Among policy options that are currently used in environmental governance and reported by scientific literature, legal–regulatory and economic instruments are more frequent than sociocultural or customary and rights-based instruments. These latter two groups, however, engage more heterogeneous actors and represent more diverse values and knowledge systems, which increase their transformative potential and thus offer underutilized opportunities to arrive at more inclusive and sustainable solutions for governing social–ecological systems at multiple scales.

An additional review of 43 case studies, analyzing which policy options are promoted and used by international environmental initiatives, showed that the transformative potential of policy instruments is highly context- and application-specific (for methodological details see Appendix). In cases where policy options facilitated elements of transformative governance (e.g. the United Nations Educational, Scientific and Cultural Organization's Biosphere stewardship program [35], or the community-based marine monitoring supported by the Global Environmental Facility [36]), policy development and implementation were often approached as a learning activity, and in ways that allow for broader and more diverse engagement. These cases used a broad range of flexible criteria that represented diverse actors, values, and knowledge systems along the policy process, and accounted for social–ecological complexity. More diverse values were associated with a higher number of transformative criteria met by an initiative, suggesting that incorporating diverse values is a key aspect of transformative governance (Figure 1).

The assessment reinforced that policy mixes that apply sociocultural, customary, and rights-based policy instruments besides more frequently used economic and legal instruments offer opportunities to reconcile multiple interests, values, and norms while recognizing trade-offs and uneven power relations between stakeholders [37,38]. Such policy mixes are already evident in landscape approaches, in multistakeholder platforms created at different policy levels, in innovative urban planning paradigms, in alternative policies for agriculture and conservation (e.g. agroecology), in climate adaptation and mitigation approaches, or in health and education.

For example, the City in Nature Green Plan 2030 policy of Singapore[3] seeks to conserve nature by strengthening green space connectivity between natural and urban spaces, enhancing veterinary and animal health, and augmenting access to green spaces for cultural, leisure, and other human well-being benefits [39]. This requires synchronized planning and action across multiple government agencies and stakeholder interests [40] that speak to instrumental (e.g. health benefits, disaster risk reduction), relational (e.g. aesthetic benefits), and intrinsic values (e.g. natural species interactions). Thus, it enhances various health goals and fosters multiple livelihood goals, among others. It also demonstrates how seemingly distant planning agencies (livestock managers to urban infrastructure planners) can implement activities in a coherent manner.

Still, it is important to re-emphasize that policy options with higher transformative potential are not used frequently, especially in decisions related to nature. This is attributable to challenges in capturing noninstrumental values (that are not easily amenable to quantification) and accounting for distributional impacts. Further reasons include path dependency [41] and gaps in the capacities of different stakeholders on various aspects required to understand and execute an instrument. Operationalizing a diverse values approach will continue to be less patronized unless gaps are addressed through a mix of higher investments in research, communication, and uptake of such topics.

Weaving diverse values into policymaking

Environmental policy instruments can be less or more transformative, depending on how they are designed, combined with each other, and adapted to the context [42]. Weaving diverse values into policymaking (i.e. identifying, understanding, recognizing, and considering different values along the policy process) increases the transformative potential of environmental governance. Still the question arises: how to guide a process of weaving diverse values into policy without oversimplifications? This question is especially critical because policymaking, while often described as a cycle with clear steps, is a rather complex and multicentric process [43], where policy options emerge, get selected,

[3] https://www.greenplan.gov.sg/key-focus-areas/city-in-nature/, last accessed 01-04-2023.

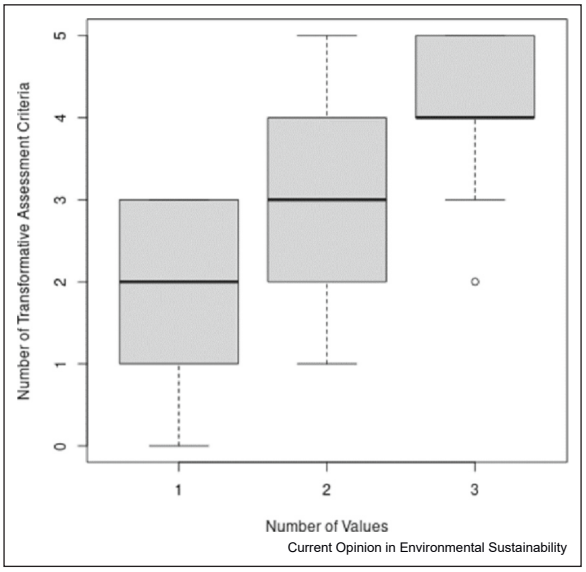
Table 1

Assessing the transformative potential of different types of policy instruments.

Policy instrument types and selected examples	Criteria to assess transformative potential (scores between 0 and 2)					Limitations and potential pitfalls	Prevalence (n = 62)	Illustrative references for the exemplary instruments
	Address direct and indirect drives	Weave diverse values	Stimulate institutional change	Promote capacities	Be integrative and adaptive			
Economic and financial (n = 13)	1.7	0.9	0.9	0.5	0.9	Vested interests, overrepresentation of instrumental values, and high transaction costs impede the implementation of highly transformative solutions.	37.7%	[30,31]
For example, alternative economic models	*2*	*2*	*2*	*1*	*2*			
Legal and regulatory (n = 13)	1.2	1.0	1.0	0.5	0.7	Enforcement is challenging due to power asymmetries, difficult to quickly adapt the legal structure, and coercive nature does not help capacity development.	82.0%	[32]
For example, rights of nature	*1*	*2*	*2*	*2*	*1*			
Rights-based and customary (n = 4)	1.0	2.0	1.3	1.3	1.0	Inclusive of diverse values but highly context-dependent, often incoherent with legal or economic instruments, suffering from power imbalances, and therefore difficult to upscale.	8.2%	[33]
For example, other effective area-based conservation	*1*	*2*	*2*	*1*	*1*			
Social and cultural (n = 7)	1.7	1.1	0.9	1.1	0.3	Highly diverse group of instruments implemented by a wide range of actors on a voluntary basis, measuring/monitoring achieved impacts, and upscaling is difficult.	18.0%	[34]
For example, comanagement regimes	*2*	*2*	*1*	*2*	*1*			

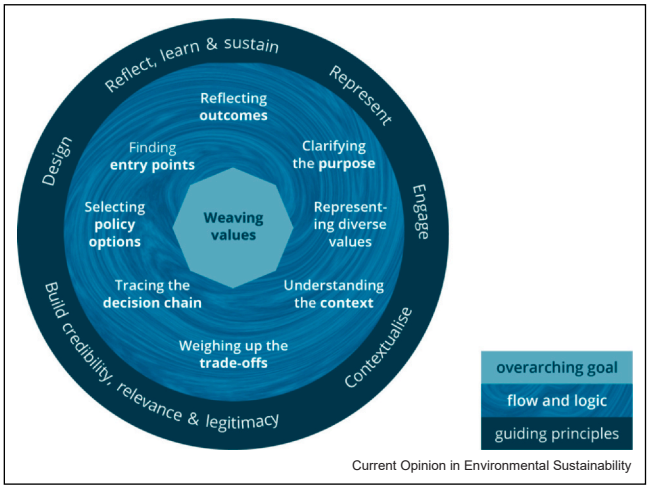
The scoring of the policy instruments across the five assessment criteria was based on expert judgment. Scores varied on a nominal scale from 0 (not meeting the given criterion) to 2 (fulfilling the given criterion). The table indicates average scores for each type of policy instruments, and specific scores for one selected instrument within each type (in italics). Prevalence indicates which types of instruments are reported more frequently in the literature based on the review of 62 papers on policy uptake.

Figure 1



Median number of transformative change criteria associated with policy options of varying diversity (n = 43 case studies). Policy options that address one value are associated with a median of 1.9 (IQR 1–3) transformative change criteria, while those that address two or three values are associated with 3.2 (IQR 1–5) and 4.1 (IQR 3–5), respectively.

Figure 2



The kaleidoscope of values in policymaking. The figure illustrates that weaving diverse values can be facilitated through a process that leads through several junctures, such as identifying the purpose, stakeholders, and divergence/convergence between them, reconciling trade-offs, engaging in implementation, and evaluating outcomes. To foster a smoother process of engagement, six guiding principles have been identified that ensure the representation of different stakeholders, the meaningful and deliberate engagement amidst them, and therefore guarantee that the process is contextualized, fair, legitimate, and thereby credible, more equitably designed, and reflexive.

implemented, and evaluated in the interplay of multiple actors, values, and interests.

Considering policymaking as a kaleidoscope, critical junctures and guiding principles can be identified to weave diverse values into the policy process (Figure 2). These points help address specific questions related to decisions that have an impact on nature and its contributions to people, ranging from the identification of relevant stakeholders, right-holders, knowledge-holders, and their socio-environmental and political contexts, through addressing potential trade-offs and value conflicts that may arise from different decisions, to arriving at feasible entry points and — hopefully — more just and sustainable outcomes.

Weaving values into the policy process requires different types of capacities both at individual and organizational level, to enable information exchange between and within networks [44], which incorporates diverse knowledge systems [45], fosters knowledge coproduction [46], and leads to synergistic actions. Such efforts should be understood as dynamic social processes of knowledge brokerage: bridging boundaries by transforming concepts, principles, perspectives, and knowledge into information that can be used and acted upon to influence decision-making in the real world [47,48]. Enhancing the information flow and strengthening the adaptive capacities of different actors at all intervention levels is key to balance power asymmetries, improve the outputs of negotiations, and reach more just and sustainable results [38,49].

Enhance adaptive capacities to aid values-weaving

The capacity of social–ecological systems to adapt to, and recover from, the intertwined climate, health, and environmental crises has received growing attention in the last decade [50,51]. Adaptive capacities can also support the shift toward values-centered policymaking by 1) building awareness and desire when operationalizing diverse values in decision-making; 2) providing knowledge and tools; 3) bringing together different ways of knowing and doing; 4) navigating trade-offs and uptake; 5) learning, adapting, and acting together; and 6) creating fair processes and institutions. The first three aspects allow the diverse values of nature to be recognized and understood by all relevant actors who take part in decision-making, while the last three aspects can ensure that fair institutions are created, which incorporate diverse values of nature in policymaking in an explicit and legitimate way [12].

Since capacities are multidimensional, layered across societal groups, context-specific, and unevenly distributed geographically [52,53], developing capacities is equally important at personal, organizational, and

systems levels. It often presumes that progress should be achieved compared with a base of existing (low) level of knowledge, skills, and resources via different approaches (e.g. formal trainings or mentorship) [54]. However, it can also be understood as a process of colearning between different actors, which can help transform top-down policy processes by enlarging the set of knowledge that decisions are built on, acknowledging a wider range of values of nature, and addressing power imbalances. Colearning approaches also enhance the understanding of status, trends, drivers, and impacts on nature and nature's contribution to people and help identify workable policy options [55].

Conclusions

Based on a meta-analysis of environmental policy options, this paper argues that rehauling the decision process toward sustainability is possible, if formal and informal institutions (i.e. laws, norms, and policy instruments) are reoriented toward eliciting and incorporating diverse values at various junctures of the policy process. Following the value-weaving path at these junctures can aid decision-makers, as signposts help travelers on their journey: by indicating desirable outcomes that encourage transitions toward just and sustainable futures. Although general guiding principles can be identified, acting upon them requires more than technical skills, governance capacities, or negotiation abilities. Bringing together different ways of knowing, coordinating across scales and different social groups while balancing inequalities, and awakening inner motivations to consider diverse values are equally important. These findings emphasize that to achieve transformations toward sustainability, policy design, and implementation requires inclusive, participatory, and deliberative approaches across the spectrum of actors who influence any decisions related to nature and its use.

Data Availability

All data on which this paper is based are available in the IPBES methodological assessment on diverse values and valuation of nature.

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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Appendix: Methodological details of the assessment of different policy options' transformative potential

To develop the assessment criteria for transformative governance against, we can assess the potential of policy instruments to facilitate transformative change, we conducted a literature review. From the literature review, we identified various aspects of transformative governance, which we then grouped into five main components (further discussed in the main text). These were address status quo, address diverse values, stimulate institutional changes, capacity-building, and integrative–adaptive governance. Within these broader categories, we defined the following criteria:

Address status quo

- Does the policy instrument/initiative address the direct and indirect drivers of biodiversity loss (based on the IPBES Global Assessment)?
- Does the policy instrument stimulate and/or promote a positive major shift to the states of ecosystem and biodiversity?
- Does the policy instrument stimulate and/or promote a positive major shift in the social networks and power distribution?
- Does the policy instrument stimulate and/or promote a positive major shift in rules and resource allocation in biodiversity governance?
- Does the policy instrument promote positive changes in social production and consumption toward a more sustainable pattern?
- Does the policy instrument challenge the inequalities and able to promote equalities among the social group involved in biodiversity management?

Address diverse values

- Does the policy instrument stimulate and/or promote a positive major shift in recognizing and revealing diverse knowledge and values of biodiversity?
- Does the policy instrument provide room to accommodate or consider diverse values of different groups in biodiversity management, including the values of the local and indigenous people rooted in their indigenous local knowledge, in its decision-making process?
- Does the policy instrument reflect or accommodate social and cultural values of the local community?
- Does the policy instrument reflect or accommodate the indigenous local knowledge values of the local and indigenous people?

- Does the policy instrument acknowledge or accommodate the trade-off between values of biodiversity, including values of the marginal and underpowered group?

Stimulate institutional changes

- Does the policy instrument stimulate positive shifts (radical or incremental) in the organization, legislation, policies, and administration regarding biodiversity governance?
- Does the policy instrument stimulate positive changes (radical or incremental) in the behavior, culture, and practices of actors involved in biodiversity governance?

Promote and supported by sufficient capacity of actors

- Do the actors have sufficient capacity to design the policy instrument?
- Do the actors have sufficient capacity to implement the policy instrument at the targeted level(s)?
- Do the marginal, under-represented, and less-powerful groups be able to participate and influence the decision-making process throughout the policy process?
- Do the actors have sufficient capacity to recognize and reveal the values of biodiversity throughout the policy instrument design and implementation?
- Do the actors have sufficient capacity to collaborate, colearning, and coproducing values of biodiversity throughout the policy instrument?
- Does the policy instrument improve the capacity of actors to recognize diverse values of biodiversity in the decision-making process?
- Does the policy instrument improve the capacity of actors, particularly the marginal and less-powerful groups, to express their values of biodiversity in the decision-making process?

Integrative and adaptive governance

- Can the policy instrument be integrated into a policy-mix to stimulate positive transformation in biodiversity governance?
- Can the policy instruments be adapted into local socio-economic–political culture to stimulate transformations in biodiversity governance?
- Does the policy instrument reflect the complexity and uncertainty of biodiversity values from different actors at the different levels involved in the biodiversity governance?

We assessed altogether 37 policy instruments. The initial list of policy instruments was derived from the IPBES Catalogue of Policy Instruments and Policy Support Tools [29]. Additional policy instruments were added to this list after the screening of the IPBES Global Assessment and regional assessments. The assessment of the policy instruments is a meta-analysis: the main source of evidence used was the core text and the Annexes of Chapter 6 of the IPBES Global Assessment, and where evidence was scarce, additional targeted literature reviews were carried out.

The assessment focused on evaluating the potential of policy instruments to change the current status quo either through incremental steps or via more transformational processes. Assessing how far policy instruments can support transformational or incremental is challenging for several reasons. First, for many instruments, there is a lack of detailed empirical evidence on place-based implementation. Second, in practice, several policy instruments are implemented at the same time as part of a policy-mix, hence the impacts of a single instrument are hard to identify as those usually emerge as a result of interplay (synergies or incoherencies) between all the used instruments. Third, even where robust evidence is available for a single instrument, it often shows a high variability across the different contexts. This highlights that how far a policy instrument supports transformational or incremental change depends largely on how exactly it is implemented and how much it aims to challenge the institutional settings that maintain the status quo. These challenges of evaluation lead us to choose the potential for change (either transformational or incremental) as the focus of our analysis.

The potential for incremental or transformational change was evaluated via the above detailed five criteria. Each of these five criteria was assessed on a three-point scale: (1) unlikely to meet the criteria if maximum one subquestion could be answered by yes (score = 0), (2) medium potential to meet the criteria if 2–3 subquestions could be answered by yes (score = 1), and (3) high potential to meet the criteria if three or more subquestions could be answered by yes (score = 2). Whether a policy instrument has potential for inducing incremental or transformational change was decided based on the scoring:

- Policy instruments were justified as having more transformational potential if the average score across the five criteria was equal or higher than 1.5,
- Policy instruments were justified as having more incremental potential if the average score across the five criteria was higher than 0.8 and lower than 1.5,
- Policy instruments were justified as maintaining the status quo if the average score across the five criteria was equal or lower than 0.8.

Additionally, we collected and synthesized information on all instruments regarding what kind of valuation approach (a pluralistic and inclusive valuation or a narrower approach) is usually referred to in the literature for the given instrument (although information on this aspect was often scarce), who are the key stakeholders implementing or being influenced by the instrument, what is the potential scale(s) of implementation, and what is the geographical spread of implementation.

To investigate consequences of narrow and plural value approaches more deeply in and for policy, we assessed 46 international environmental initiatives that are active at global or large regional scales. We define environmental initiatives as an agency, movement, or organization that works at a large regional or global scale and manages or influences (e.g. funds) multiple projects on the ground. For inclusion in our list of initiatives, we had to ascertain that an agency, organization, or movement

- Oversees or (aims to) influence place-based projects, programs, policy, and decisions related to conservation of biodiversity and ecosystem services;
- Is active over large regional (e.g. continental/subcontinental) or global scales;
- Concerns outcomes that link to biodiversity and ecosystem services;
- Advocates knowledge and awareness regarding narrow, plural, or both values within its project activities;
- Has project and institutional documents available in the project domain.

To identify initiatives, we used the following search criteria using Google Search, and screened them against the inclusion criteria: "Environmental project", "Ecosystem service valuation initiative", "Ecosystem service valuation project", "Biodiversity project", "Biodiversity initiative", "Nature Project", and "Environmental Project". We also used "Environmental valuation initiative" and "Environmental valuation capacity building". We also reviewed the IPBES database of policy support tools [29] to include any support tools that qualified under our initiative definition.

Upon establishment of our initiative list, we conducted a superficial assessment on the inclusion of diverse value approaches in each initiative, based on the initiatives' mission, vision, "about", and project web pages. We assessed each initiative against the following criteria:

- Value(s) being addressed (based on IPBES typology: holistic value, health value, economic value, sociocultural value, and biophysical value) explicitly addressed in the description of the initiative, its mission and vision, and description of projects/work
- Values' typology (intrinsic, instrumental, and relational)
- Diverse values present or not. We considered an initiative to have diverse value inclusion when more than one value type (relational, instrumental, and intrinsic) was addressed
- Whether or not the vision, mission, and "about us" pages considered indigenous and local knowledge
- The IPBES region where an initiative was active (i.e. Africa, America, Europe–Central Asia, Asia-Pacific, and Global)
- Dominant decision-making context: use, conservation, or development
- Does it include targeted policy themes?
- Does it speak to grand challenges?
- Goals/objectives of the initiative
- Work area boundary (Glob, Reg, Nat, Sub-nat, Ecosystem, and Sect)
- Decision-makers targeted

The superficial assessment of initiatives allowed us to assess how initiatives were generally aspiring to diverse value approaches, but to assess how diverse value approaches in policy were used to facilitate transformative governance, we assessed specific case studies that documented evidence of policy support for transformative governance.

To identify case study for each initiative, we used one of two approaches:

- We searched the SCOPUS and Web of Science databases using the following search string: "[name of initiative]" AND "values" AND "policy" AND "transformative governance" OR "status quo" OR "institutional change" OR "capacity building" OR "integration" OR "adaptation".
- Where an above search yielded no results, or papers that did not provide sufficient information or evidence, we also used case studies reported on the initiative's web page.

We balanced case studies by region, and specifically selected case studies that involved indigenous people and local communities. Generally, we selected case studies that presented more evidence on how policies could support transformative governance. We assessed each of the example initiatives along the following aspects:

1. What policy instruments are associated with the case?
2. Category of policy instrument
3. Elements of transformative governance present

4. Decision-making contexts
5. Stakeholders
6. Which broad values, specific values, and life frames are accounted for in the application of this policy instrument
7. At what scale is this policy instrument implemented? In this case, we used local, provincial/state, national, regional, international, and cross-scale
8. In which way did the application of policy support tools facilitate incorporation of (a) diverse value approaches and transformative governance
9. Leverage points

For question eight, the dimensions differed from case to case, but elements that emerged included: what is the evidence for transformative governance presented (refer to subindicators), in which way were policy support tools used to facilitate policy implementations, how were stakeholders involved, and were multiple policy approaches used?

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Current Opinion in Environmental Sustainability

The role of values in future scenarios: what types of values underpin (un)sustainable and (un)just futures?

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Values have been recognized as critical leverage points for sustainability transformations. However, there is limited evidence unpacking which types of values are associated with specific types of sustainable and unsustainable futures, as described by future scenarios and other types of futures-related works. This paper builds on a review of 460 future scenarios, visions, and other types of futures-related works in the Intergovernmental Science-Policy Platform on Biodiversity and Ecosystem Services Values Assessment, synthesizing evidence from academia, private sector, governmental and non-governmental strategies, science-policy reports, and arts-based evidence, to identify the types of values of nature that underlie different archetypes of the future. The results demonstrate that futures related to dystopian scenario archetypes such as Regional Competition, Inequality, and Breakdown are mostly underpinned by deeply individualistic and materialistic values. In contrast, futures with more sustainable and just outcomes, such as Global Sustainable Development and Regional Sustainability, tend to be underpinned by a more balanced combination of plural values of nature, with a dominant focus on nature's contribution to societal (as opposed to individual) aspects of well-being. Furthermore, the paper identifies research gaps and illustrates the key importance of acknowledging not only people's specific values directly related to nature, such as instrumental, intrinsic, and relational human-nature values and relationships, but also broad values and worldviews that affect the interactions between nature and society, with resulting impacts on Nature's Contributions to People and opportunities for a good quality of life.

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This review comes from a themed issue on **Values for transformative change: The IPBES approach**

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Introduction

With pressing social and environmental challenges across local to global scales, there is a need to urgently shift human development toward more sustainable and just trajectories [1]. In this context, achieving social–ecological transformations (i.e. fundamental shifts in human–environmental relationships [2]) relies on people's decisions and actions, which in turn depend on their different motivations, including values[16] [3–5].

Assessments by the Intergovernmental Science-Policy Platform on Biodiversity and Ecosystem Services (IPBES) indicate that different types of futures, spanning from just and sustainable ones to those burdened by social and environmental challenges and inequalities, may be underpinned by different combinations of values motivating the decisions and actions of the imaginary actors included in the scenarios[17] and other types of futures-related works [6,7]. In spite of previous research interest in the role of values in scenario-development processes within the field of futures studies [8–11], the exploration of related findings in the context of current sustainability science has been only fragmentary, and the role of values in shaping different futures remains understudied (cf. e.g. [6]). Furthermore, there is increasing interest in understanding the role that values can play in transformations to sustainability [12]. To address these issues, the IPBES Values Assessment conducted a comprehensive structured review of the role of values in over 460 scenarios and other types of futures-related works (13–15,91; Supplementary material). Since IPBES focuses primarily on social–ecological dynamics related to the state of nature (including ecosystems and biodiversity) and nature's contributions to people (including ecosystem services) [16], the focus of this review was on people's values that are generally related to nature.

This work builds on the IPBES structured review and presents a synthesis of the combinations of values that underlie different types of scenarios, based on evidence from academia, private sector, governmental and non-governmental strategies, science-policy reports, and arts-based evidence. With implications for both policy and research, we highlight which types of values co-occur in futures that are normatively described as desirable or undesirable by their authors, while also reflecting on gaps for future exploration.

What role do values play in future scenarios?

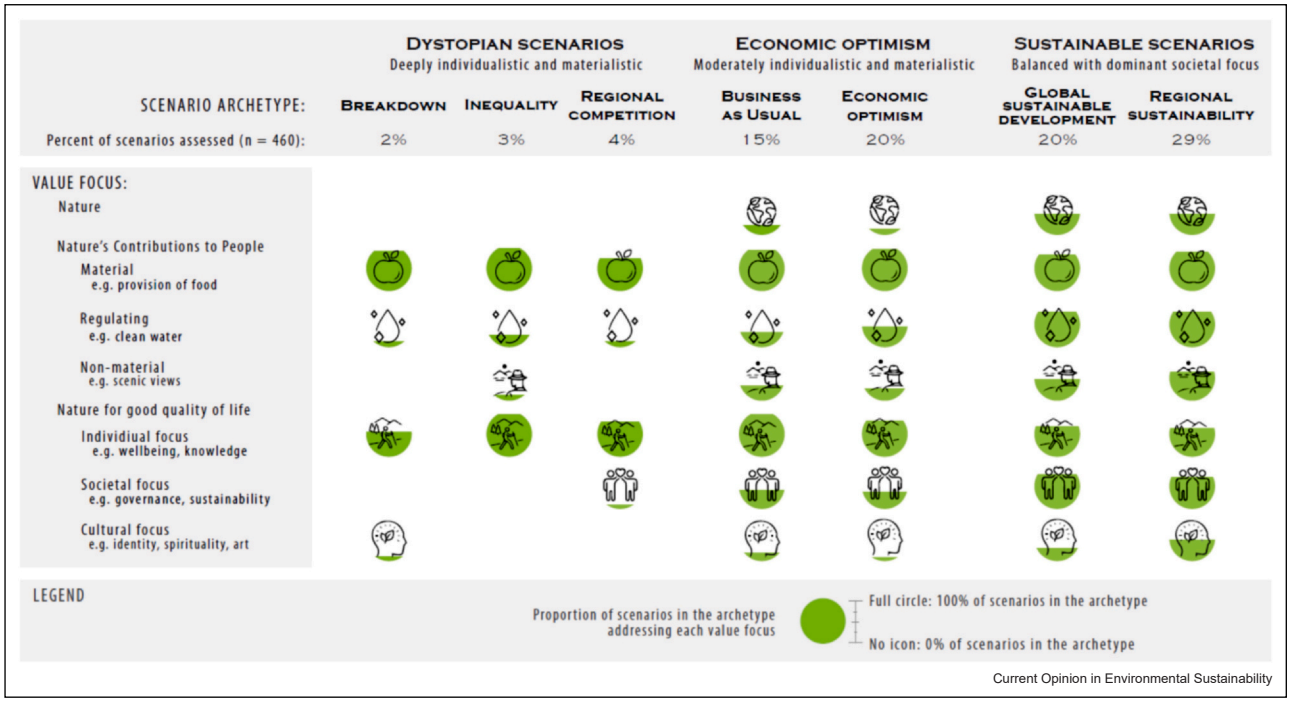
Values of nature, held by the envisioned people, groups, and societies acting within co-developed futures and scenarios, play a crucial role, as they shape the dynamics of the imagined futures in several ways [17]. Importantly, in this review, we focus on the values held by imaginary actors within future scenarios; reflecting on the values implicitly imprinted into scenarios by people taking part in their development (researchers, experts, public sector representatives, etc.) arguably requires a different set of methods and is thus beyond the scope of this study [18].

First, values held by different scenario actors underlie what aspects of the current world these actors find desirable or undesirable. Thus, values can impact decisions across scales, from individual decisions and behaviors to the functioning and goals of society and the larger social–ecological system [19]. This, in turn, influences the decisions and actions people take, driving the directions in which future pathways unfold [20]. For instance, actors who place high value on material abundance and comfort may prefer consumption-oriented lifestyles, potentially triggering future pathways with greater environmental sustainability- or justice-related challenges [21]. Second, actors in different contexts as well as across spatial, temporal, and political scales, hold different values shaping their vision of what the world should look like in the future [22]. These values, with associated relational dynamics and inherent power asymmetries, can influence the type of future outcomes that they consider desirable and thus worth pursuing. For

[16] (In this study, we understand values as a general term to describe "what is important to people and why" [74], incl. life "goals, beliefs and general guiding principles" as well as "judgements or measurements of the importance of specific things in particular situations and contexts" [23,24].)

[17] (For the purpose of this study, we define scenarios broadly as qualitative or quantitative descriptions of potential future development, including both its environmental and social dimensions) [88,89]. Hereafter, the paper refers to scenarios in this broad sense, including multiple types of futures-related works such as future visions and pathways [90].

Figure 1



Value foci by scenario archetype. Each type of a value focus is rendered by a different icon. The proportions of reviewed future scenarios addressing different focal values related to nature, nature's contributions to people, and good quality of life are symbolized by proportional shading of the circle underlying each icon (see legend). Global Sustainable Development and Regional Sustainability are characterized by a larger value plurality compared with the other scenario archetypes. (Figure based on the IPBES Values Assessment [14]; see the Supplementary material for the underlying data).

instance, some actors may value individual freedom and prioritize steering their world to a state where individuals do not feel responsible for others, while other actors may value collaboration, care and reciprocity, and seek to steer the world toward a state where people feel collective responsibility for each other, with implications for societal and environmental governance [23].

A number of frameworks have been developed to unpack different types of values, from more categorical to more holistic ones [23–29]. In this respect, to better understand the role of plural values in future scenarios, we adopted the value approach gradually developed within IPBES [24,30] and applied two perspectives: first, the perspective of *value foci*, which shows whether nature is valued for itself (e.g. in the case of species protection), for its role in the provision of nature's contributions to people (e.g. material, nonmaterial, and regulating), or for supporting different aspects of human good quality of life (understood in IPBES as a context-dependent, nonprescriptive set of qualities related to individual, societal, or cultural well-being [16,30,31]; Figure 1). Second, we embraced the perspective of *value justification*, which elucidates whether actors value nature for its own inherent worth (intrinsic values of nature), for its function in achieving desired outcomes (instrumental values of nature), or for its unique human–nature interactions (relational values of nature) [30]. These two perspectives are related but distinct, for instance, value focus on nature itself may be justified by intrinsic, instrumental, and relational values, or their combination. A complementary IPBES-related perspective on values distinguishes between *broad values* as held, first-order preferences transcending contexts and guiding people's evaluation of events (also referred to as core values [12,32]), and *specific values*, as assigned, second-order preferences relating to the worth or importance of a particular object, or state of the world (also referred to as contextual values [12,33]) [24,29,34,35]. In this study, we draw upon this perspective in the discussion part below.

Although numerous social–ecological scenarios exist at different scales and encompass various geographic contexts, they tend to adhere to a small number of general storylines and assumptions, often referred to as scenario families or *archetypes* [7,36,37]. The main purpose of scenario archetypes is to amalgamate the variety of available scenarios into a smaller number of scenario narratives that illustrate the most important differences in how future pathways may unfold [38]. IPBES science-policy assessments build on several seminal scenario

archetype classifications and apply these deductively to categorize reviewed futures works [7,39]; for the purpose of this review, in order to comply with the IPBES context, we have used the scenario archetypes formulated by the IPBES Regional Assessment for Europe and Central Asia, namely the archetypes of Business as Usual, Economic Optimism, Regional Competition, Inequality, Breakdown, Regional Sustainability, and Global Sustainable Development (see the Supplementary material and [6,36] for detailed characteristics of the archetypes). Categorizing reviewed scenarios into scenario archetypes has demonstrated benefits in terms of conciseness and synthetic power; however, it is important to note that this approach may partly conceal the nuance and level of detail incorporated in the original scenarios [7].

Which combinations of values underpin different futures?

Our structured review identified a pattern of value combinations in the evidence provided by available future scenarios (Figure 1), illustrating what combinations of value justifications and foci may underlie different pathways and lead to different futures [13] (see Supplementary material section A — Review Methodology). The following summary highlights that the focus of most of the reviewed scenarios was primarily on specific values related to nature, their focus, and justification, rather than broad values (of nature and beyond), which represents one of the key points further discussed below.

Values in dystopian scenario archetypes

The first group of scenarios characterized by similar value patterns are scenarios often normatively described as dystopian by their authors. These scenarios generally fall into three archetypes: 'Regional Competition', 'Inequality', and 'Breakdown'. In general, such scenarios depict a world in which inequalities in wealth, power, and knowledge increase both between and within countries. They assume a deterioration of societal bonds, whether between elites and the masses, within international bodies and countries, or communities and individuals. These scenarios typically suggest negative impacts on nature and the environment due to loosening regulation, dysfunctional governance, or increasing exploitative use of natural resources stemming from people's full dependence on local resource base resulting from conflicts and growing barriers to trade [36,40,41].

The underlying values in the dystopian scenario archetypes tend to be a combination of deeply individualistic and materialistic instrumental values. The actors whose values are implemented in these scenarios are generally driven by the preference for individual aspects of good quality of life, including individual wealth, individual access to healthcare and education, and individual livelihood security, which may be interpreted as a reaction to the harsh conditions of the dystopian scenarios combined with the lack of societal structures supporting solidarity and collaboration [42]. It is crucial to note that actors and societies in these scenarios tend to strongly favor individual solutions over collective ones; at the same time, scenarios rarely provide insights into the envisioned power dynamics among scenario actors and their implications for whose values get to be enacted. From the perspective of a value focus, these scenarios assume a preference for material benefits from both nature (in the form of material nature's contributions to people) and anthropogenic assets, over non-material benefits [43].

Values in economic optimism archetypes

The second group of scenarios resembles the continuation of current trends in various ways, particularly with regard to relying on technological solutions to environmental challenges and reactive policies to tackle sustainability crises. These scenarios fall into the 'Business as Usual' and 'Economic Optimism' archetypes, where dominant assumptions are that economic growth will remain a strong driver of future development, and challenges resulting from the use of fossil fuels, environmental pollution and degradation, and public health deterioration will be tackled by rapid adoption of technological developments. Similarly to the previous group, these scenarios are rooted in individualistic and materialistic instrumental values [44]. However, an important difference to the previous group lies in the presence (be it weak) of additional types of value foci (e.g. appreciating regulating and non-material contributions of nature such as clean water or scenic views), leading to a more diverse mix of underlying values compared with the first group of scenarios [45]. Still, available modeling studies highlight potential negative consequences of these scenarios, particularly on the state of nature, including ecosystems and biodiversity [6,46].

Values in sustainability scenario archetypes

The final group of scenarios includes pathways leading to a future world that is more sustainable and just compared with current trajectories, according to the respective authors of the reviewed scenarios. These scenarios can be classified into two archetypes: 'Global Sustainable Development' and 'Regional Sustainability', both of which assume the achievement of sustainable and just futures, but they differ in the pathways to reach associated sustainability and justice goals. The 'Global Sustainable Development' archetype includes relying on international cooperation, strong governance, and high-level dedication to address global sustainability challenges, while 'Regional Sustainability' scenarios assume a transformation toward sustainability through less material- and energy-intensive lifestyles, a shift in values

toward non-material, convivial aspects of life such as good relationships, and a strong turn to more localized governance.

The 'Global sustainable development' and 'Regional sustainability' archetypes share a common feature with the previous scenario groups, which is a strong representation of values for material nature's contributions to people. However, unlike the previous scenario groups, these archetypes also strongly value regulating contributions (e.g. regulation of climate, erosion or water quality and quantity) and non-material contributions (e.g. nature-based recreation or inspiration).

One of the key characteristics of both of the sustainability archetypes is their emphasis on the contribution of nature to societal aspects of good quality of life, such as sustainability and resilience, cultural diversity, care, distributional justice, and equity [30,47–50]. In addition, they highlight values for nature's contribution to cultural aspects of good quality of life, such as sense of place and community, historical values, stewardship, interactions between people and nature (in some cases seeing humans as inseparable to nature, or humans as nature), and artistic and spiritual inspiration, which sets this group of scenarios apart from the rest of the reviewed scenarios.

The scenarios in both of the sustainability archetypes reflect a greater plurality of values than the previous two scenario groups. This plurality occurs not only in terms of the focus of the values, but also in terms of higher representation of intrinsic and relational values, particularly in the case of the 'Regional sustainability' scenarios. This highlights a significant difference between the scenarios reaching sustainable and just outcomes, the dystopian scenarios, and the business-as-usual and economic optimism scenarios.

Remaining gaps and directions for future research

The structured review points to several significant gaps that hinder our current understanding of the role of values in future development.

Developed futures-related works (including scenarios, visions, etc.) tend not to explicitly unpack the values motivating the decisions and actions of the imaginary people, groups, and societies acting within the scenarios [6,14]. While futures-related works often include an economic, biophysical, or sociocultural valuation of their outcomes (e.g. economic value of a potential future landscape resulting from a certain decision-making pathway, its biophysical function, or aesthetic appreciation) [51], this type of analysis should not be confused with the underlying values that guide actors' behavior in scenarios. Although initial work has developed frameworks facilitating the explicit articulation of values in scenarios (such as the Nature Futures Framework [52] or the Life Framework of Values [53]), further research needs to focus on both understanding the causal connection between actors' values and actions (e.g. the value-action gap) in future scenarios [54], and identifying methods that coherently connect actors' values, actions, and their impacts on sustainability and justice outcomes [55]. To this end, there is the need for sustainability research to embrace the full potential of approaches facilitating these connections, for example, by building on the long-term engagement of futures studies in issues related to values [10,18] through techniques such as causal-layered analysis [56], artistic research methods and serious games [57–61], as well as futures studies' discussions on imaginaries and worldviews [11]. Further exploration and reflection of these approaches can help us better understand why top-down scenario assessments and processes tend to feed to decision-making processes more often than game-based and learning-based approaches, despite the call for their more widespread use [57].

The available evidence indicates a clear skew toward designing scenarios assuming sustainable development, business-as-usual, or economic optimism trajectories among the current research and practitioner communities. Scenarios depicting a dystopian future characterized by societal fragmentation along political, cultural, wealth, or access axes have been notably underrepresented in the review, as the identified futures works tended to focus rather on business-as-usual types of futures, or futures closer to the Economic Optimism or sustainability archetypes. This limitation hinders the ability to reflect on the role of values that may underlie undesirable future development in which sustainability and justice goals are not met. Although some recent studies suggest a potential increase in the use of dystopian scenarios in research [62], they remain scarce in both peer-reviewed and gray literature, and remain more represented in other sources of future visions such as speculative fiction and science fiction [63].

Most future scenarios tend to aggregate across different types of imaginary future societal actors featuring in the scenarios, without providing a nuanced understanding of whose values are prioritized and put into action, and whose values are neglected and how (i.e. via processes of the exertion of power and privilege) [64]. As a result, potential trade-offs between different interest groups or societal groups, and the implications for their types of livelihoods and opportunities remain unclear. This is further related to the general absence of explicit consideration of justice and equity issues in future scenarios across peer-reviewed and gray literature, including even implicit dimensions of distributional, procedural, and recognitional aspects [65–67].

The reviewed scenarios generally explicitly or implicitly ascribe different value types and their combinations to actors, without reflecting on the role of institutions and governance systems in shaping values dominant in each of the futures, that is, which values are favored and supported by the institutions and societies and thus more likely to be displayed or expressed by actors in the imaginary future societies [68–70]. Consequently, typical scenario exercises commonly fail to identify the specific actors responsible for the actions assumed within the scenario and that decisions are not made within sociopolitical vacuums devoid of power asymmetries [71,72]. In this respect, futuring techniques such as future personas may present a suitable tool to tease out values of people, groups, and societies acting within future scenarios [73]. In this respect, it is vital to acknowledge that the value portfolios of different types of imaginary scenario actors, whether aggregated or nuanced across different actor groups, are shaped by the projections of value patterns dominant in scenario co-developing groups and the scenario field as such, including its internal power dynamics [72].

Finally, the review illustrated that if our societies aspire to achieving sustainable and just futures similar to those outlined in the Global Sustainable Development or Regional Sustainability archetypes, related decision pathways need to be nested in futures values grounded on societal and cultural aspects of good quality of life, potentially as opposed to individual ones. This highlights a significant concern that arises when scenarios prioritize solely the focus on specific values (e.g. those associated specifically with nature), rather than considering the deeper level of broad values [74,75]. Such scenarios may overlook the pivotal role of broad values that are not directly linked to our relationship with nature, but which may have a closer connection to the underlying motivations that shape our interactions with nature, both individually and collectively.

These gaps emphasize the need for greater attention to the plural engagement of actors and knowledge-holders in scenario co-development and other futuring processes [76] in order to leverage different types of experience and knowledge (including formal and informal knowledge, local and generalizable knowledge, novice and expert knowledge, and traditional, experiential, scientific, and indigenous knowledge) [77]. Scenario developers further need to consider whether the dominant representation of instrumental values is due to the prevailing methods used for scenario co-development processes, and find ways to shift the focus from instrumental values to a more nuanced representation of plural values [78–80]. This highlights the need to address the power dimensions of which and whose values shape the development of imagined futures, as these futures have the potential to become socially performative through guiding policy-making, or occupying places in social imaginations [81]. As such, the continued representation of the dominance of instrumental values as opposed to more pluralistic representation of values in future scenarios may prevent our collective abilities to design and choose pathways toward more sustainable and just futures, including failing to identify the need to disrupt the dominance of sustainability non-aligned types of values [82–84].

This review finds that those who construct future scenarios and other types of futures-related works tend to agree that values need to be diversified and balanced to achieve transformations to sustainability. However, research into how to intervene to shift the balance of values remains in its infancy [83,85]. While the primary proposal of the IPBES Values Assessment is to incorporate greater diversity of values, there is an important complementary question about how people balance this diversity: which values do we want more of and which we need less of? [83].

Conclusions

Collectively building a sustainable future that is just for all human and non-human actors requires a concerted and transformative effort. Values play a fundamental role in determining the general direction of our collective pathways, and understanding their role is crucial for developing policies and strategies for promoting a shift toward more just and sustainable trajectories [92]. The gaps identified by this review highlight that even scenarios primarily focusing on sustaining nature and its contributions to people urgently need to pay attention, not only to specific values of nature, but also to the broad values of different actors [86]. Such broad values influence actors' preferences toward different modes of societal functioning. These include responsibility for others versus responsibility for self, or level of individualism versus preference for collective solutions, which may have deeper influence on sustainability- and justice-related outcomes than values related to nature itself. Co-developing such knowledge requires plural ways of engagement between scientists and stakeholders and paying higher attention to causal links between actors' values, decisions, actions, and outcomes in scenarios and futures-related works in general [87].

Data Availability

The core part of the data is shared in the Supplementary material.

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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Appendix A. Supporting information

Supplementary data associated with this article can be found in the online version at doi:10.1016/j.cosust.2023.101343.

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- •• of outstanding interest

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The study argues that in order to meaningfully engage with values as transformative leverage points, transformation research needs to distinguish between two distinct modes of knowledge production and mobilization. The study reacts on the critical knowledge gap related to the value-related mechanisms potentially triggering sustainability transformations.

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