

The role of power in leveraging the diverse values of nature for transformative change

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1. Introduction

Transformative changes (i.e. fundamental and wide reorganization of social, political, and economic systems, including paradigms and values [1]) are needed to address the global socio-ecological crisis. The urgency of this crisis is evident through ongoing biodiversity loss, livelihood insecurity, and the escalating climate crisis, all of which exacerbate social and economic inequalities [2,3]. These phenomena are symptoms of the prevalent worldviews and associated values regarding human-nature relationships that influence practices and decision-making about nature [4,5,6]. Transformative changes require deep structural adjustments, including the mobilization of sustainability-aligned (broad) values (e.g. justice, care, and stewardship of nature) against those that tend to favour individual benefits, accumulation, and resource-exhaustive exploitation¹ [7,8,9,10].

The notion of ‘values’ can both refer to guiding principles and life goals (broad values) and as context-specific justifications of what matters to people (specific values) [2,11,12]. A value-centered leverage points perspective for transformative change implies that values shape the ways that political systems, supported by institutional structures, function and influence what solutions are considered socially legitimate [5,9] and just [13]. Furthermore, it should be noted that worldviews, knowledges, broad and specific values about nature are framed, constructed, and reproduced by social structures, including institutions (i.e. norms, legal rules, and practices) underpinning political systems through which decisions are made [11,14]. In other words, power relations define which values are considered in decision-making processes that affect human-nature relationships, and if so, the level of their influence in those decisions [11]. Moreover, it is important to recognize that values themselves can also shape power relations.

¹Although, individualistic (self-centered) values may influence an individual towards pro-environmental behaviors (e.g. when benefits outweigh costs) [20], from a societal and systems perspective a shift from individualistic values is needed [18].

Scholars have identified four hierarchical and interconnected realms of leverage that represent places where a system may be intervened towards transformative change (from shallow to deeper): parameters, feedbacks, design, and intent [15,16,17]. *Parameters* are the modifiable and mechanistic characteristics of a system that are typically targeted by policymakers (e.g. incentives, standards, or physical elements of a system, rates of material flows)[18]. *Feedbacks* are interactions between elements within a system that drive internal dynamics. *Design* refers to the societal structures and institutions that manage feedback and parameters. Finally, *intent* refers to the underlying goals and worldviews that shape the emergent direction to which a system is oriented [18].

Based on the aforementioned approach, the IPBES *Values Assessment* identifies four value-centered leverage points [2,19]. These are specific interventions related to values that operate at each of the aforementioned realms of leverage: (i) undertaking valuation that recognizes nature's values / *parameters* (e.g. using methods to capture nature's diverse values); (ii) embedding valuation into decision-making / *feedback* (e.g. designing policy instruments that recognize nature's values) (iii) reforming policies and regulations to internalize nature's values / *design* (e.g. embedding sustainable development indicators vis-à-vis Gross Domestic Product (GDP) in policy decisions), and; (iv) shifting underlying societal norms and goals / *intent* (e.g. changing social norms regarding what a 'good life' is). To catalyze transformative change, no single leverage point is sufficient in itself. There is a gradient from the shallower to deeper leverage points, when moving from the first to the fourth in the above sequence [5,7]. Since the latter two leverage points are about changing societal structures, they are also the deepest ones [2].

Transformative changes are political because the aim, the 'how', and the speed of such transformations are constantly disputed by the actors involved [21,22]. In line with the deep leverage points, transformative changes also involve shifting the current power relations in society, specifically, changing the *status quo* [6,21,23]. Transformative changes imply that actors who benefit from or advocate for institutions that support unsustainable values will forego some levels of power, while the actors who uphold and defend sustainability-aligned values and their supporting institutions will gain capacity for decision-making [18,21]. Precisely because this leads to unavoidable conflicts of power, a transformative change approach to sustainability has to address not only how power asymmetries among different social actors affect human-nature relationships, but how participatory and democratic decision-making processes address these symmetries [18].

How then to interpret the concept of power in the context of using nature's diverse values to leverage transformative changes?² Power is a multidimensional concept that is highly contested in social and political sciences [24,25]. In the context of the IPBES *Values Assessment*, power is understood as the capacity of actors to mobilize agency, resources, and

²Here, we understood nature as referring to biophysical processes, environments, and systems of life, inclusive of humans and their role in these systems [36]. We acknowledge that the word *nature* does not translate across all contexts and that using and defining 'nature' is a power exercise in itself.

discourses to achieve their goals [11,24]. An important aspect of power is its capacity to shape or reinforce social structures, such as institutions [11]. Analyzing power helps understand generally common assumptions or the shared taken-for-granted prescriptions under which decision-making about nature occurs [26,27,28] Power analysis is thus central to the understanding of the formation and legitimation of certain human-nature relationships, what values of nature and valuation processes (or lack thereof) enter into decision-making systems [2,11,29], who benefits or loses from power-values interactions and the possibilities and obstacles for change within those processes [24,28].

Transition studies have recently started to unpack the role of power [e.g. 24, 25,30,31,32,33] and also of values in systems change [8,9,34]. However, there has been less attention paid to the explicit link between values and power or the role of power in enabling and changing values toward transformative changes for sustainability and justice. Moreover, the field of valuation of nature rarely discusses power relations in any explicit way [29,35]. Our aim is to analyze how power dimensions (structural, discursive) can operate in a values-based approach towards the transformative changes required to address the current nature crisis. Specifically, we i) present the power typology developed by the IPBES *Values Assessment* and conceptualize the interaction between value-centered leverage points and power dimensions towards systems transformation; and ii) illustrate how power challenges and catalyses values-centered leverage points. This research helps advance the understanding of how power influences human-nature relations and legitimizes specific values regarding nature.

2. A typology of power to understand the articulation of nature's values towards transformative changes

Power is a multidimensional concept that can be manifested at different time/space scales. Power takes the form of *discursive* and *structural* power (Figure 1). These dimensions of power shape and reproduce discourses, knowledges, and hierarchies regarding the values of nature, consequently, enabling and hindering transformative changes [37,38,39,40,41,42]. Particularly relevant for our analysis, is *framing* power as a form of *discursive* power, and *operational* and *rule-making* power as forms of *structural* power [11]. Figure 1 conveys that power relations shape human-nature relations, and it also links power with issues such as access and control to resources or nature's contributions to people (NCP) that are constantly disputed and enforced by actors that are connected through/embedded within power hierarchies. Further, the five (non-mutually exclusive) power dimensions introduced above can reinforce or conflict with each other, and thus shape all societal interactions including actors' capacities to pursue their interests and values. Because power is a highly complex and disputed notion, we recognize that the typology is not exhaustive of other approaches towards understanding power relations in the context of values and transformative change.

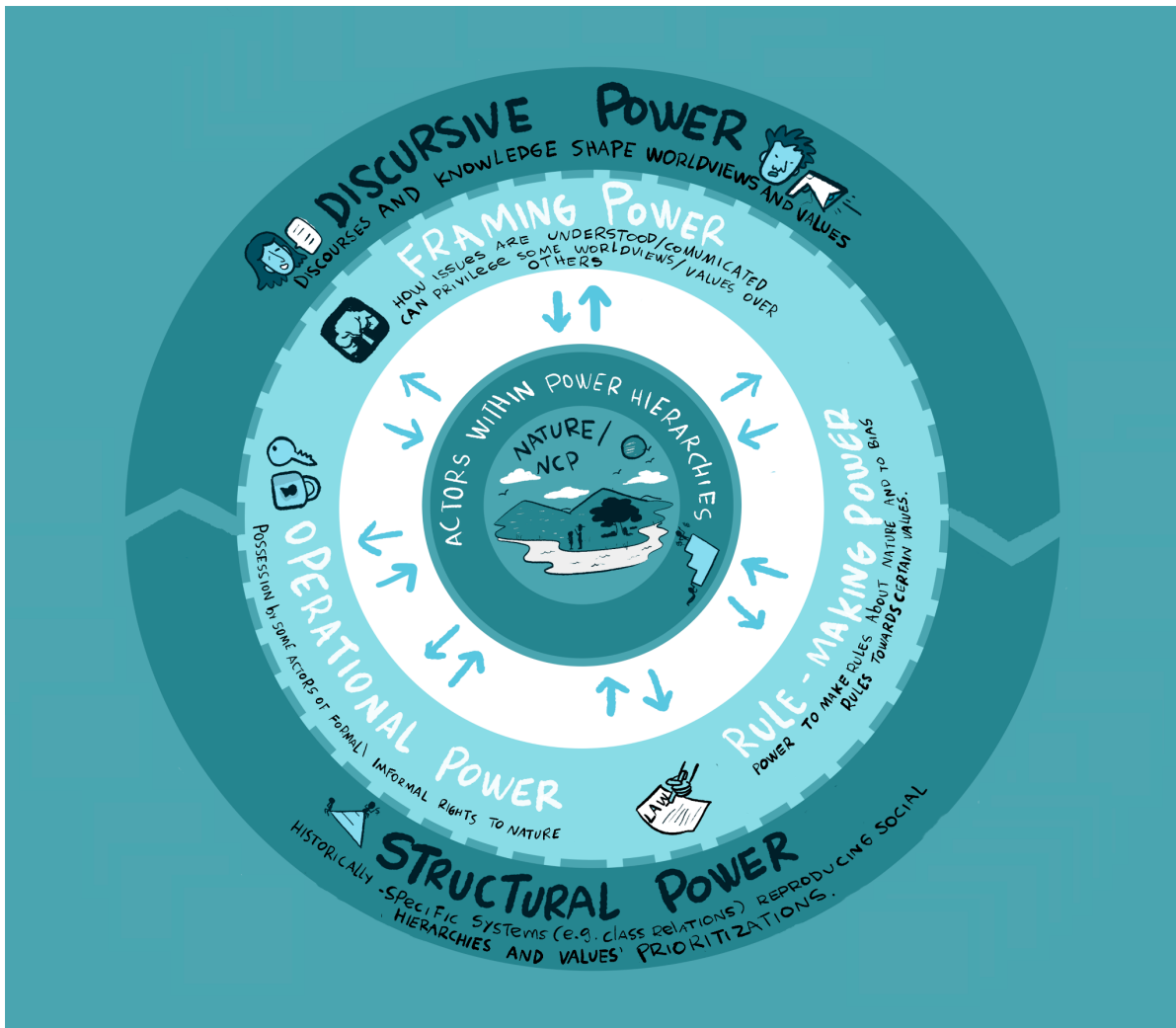


Figure 1. Power dimensions for understanding and leveraging a values-centered approach to transformative changes toward just and sustainable futures. Source: [11] with insights from [37-42]. Design by @liloacolor

Discursive power is expressed through languages and practices, and it encompasses discourses, narratives, and knowledge production aimed at shaping, constructing, or disregarding worldviews, values, and conflicting positions. Dominant narratives are needed to govern social groups and reinforce particular worldviews and values by excluding those of others [43]. *Discursive* power constructs ideas about which environmental governance institutions are possible or desirable [41,44]. However, less powerful actors may still have power to challenge this naturalized institutional logic by adopting or upholding counterhegemonic discourses and day-to-day practices (e.g. networks, demonstrations, artwork) [26,42]. Some of the value-related questions associated with *discursive* power are: Whose discourses, narratives, and knowledges shape worldviews, identities, and values? How do these constructs affect social structures and institutions determining human-nature relationships and values? How do they influence opportunities for transformative changes?

Framing power is a form of *discursive* power. It regards how issues (e.g. frameworks, projects, valuation methods) are understood, communicated and discussed, and

how this directly affects outcomes by privileging some human-nature relations, values and forms of knowledge over others [e.g. 45,46], which in turn can lead to recognition and epistemic injustices [see 13]. *Framing* power stresses that valuation and decision-making processes are guided by rules/institutions that define who can participate, the type of process in which participation is allowed, the validity of knowledge systems and rationalities, and how the conclusions will be reached (i.e. value-articulating institutions) [47]. Questions related to *framing* power include: what frameworks, projects or valuation methods are used to articulate/exclude worldviews and what capacities do they have to foster/hinder transformative change? Which knowledge systems, roles/rationalities are seen as valid and proper in such contexts?

Structural power highlights how historically-specific socio-cultural, political, and economic systems reproduce social positions and hierarchies among social groups and reinforce the prioritization of certain values over others [38,41]. Actors exercise power over others because of their position under a given institutional logic supported by certain social structures and their capacity to (re)configure structures including, inter alia, institutions such as class, race, caste, gender, and economic relations or other geographical, epistemic or status-related privileges [38,41]. Questions related to *structural* power include: What values are highlighted or obscured by dominant social structures (e.g. gender roles, class and caste-based relations, and capitalist markets)? How do actors reproduce or transform social structures and what *structural* changes generate transformative power dynamics? Which values are mobilized or ignored in such processes?

Structural power can be manifested, for example, through *rule-making* and *operational power*. *Rule-making* power refers to how actors create formal and informal institutions, including the opportunity to bias them toward their own interests and values. For example, by deciding who can or cannot participate in the *rule-making* process and in what way. Since *rule-making* is a key political process aimed at the establishment of rules, norms, and practices regarding access, use, and responsibilities over nature and NCP (e.g. property/use rights), *rule-making* power is at the core of decision-making that influences human-nature relationships. Exclusion happens in many contexts, such as watershed management [48]; the establishment of protected areas through (neo)colonialist top-down approaches [49]; and in development decisions involving large infrastructure projects, such as dams and mines [50].

Including all affected social actors does not automatically guarantee the achievement of sustainability goals (in fact, it might hinder it when marginalized social groups resist the implementation of sustainable policies), but is essential to ensure procedural justice [13] by for instance enabling safe spaces for open political deliberation and negotiation. Value-related questions to *rule-making* power include: Which values and whose values are emphasized/excluded in *rule-making* processes regarding nature and NCP? What kinds of values are associated with *rule-making* processes for transformative changes? How do

marginalized actors contest perceived injustices in *rule-making* processes about nature and transformative changes, and what counter-values do they promote?³

Operational power refers to actors who hold formal or informal rights to nature and NCP. These rights determine in practice how nature and NCP are accessed, used, and controlled. Consequently, it also determines what and whose values are emphasized in human-nature relations [51]. Such a type of power also includes control and monitoring responsibilities that ensure people's compliance with pre-established rules and norms. The distribution of *operational* power can occur by specifying nature/NCP property and use rights, which play an important role in the distribution of income and the status of nature [51]. The distinction between *rule-making* and *operational* power converges with the idea that the rules that are operationalized in practice may differ from the processes through which those rules are established [52].

For instance, in many countries, environmental legislation incorporates provisions that grant different actors *rule-making* power in decision-making processes. However, in environmental impact assessments, dominant economic prerogatives frequently trump other societal goals, such as biodiversity protection while project proponents are often the ones responsible for the participation processes which tend to limit *operational* power of local communities [e.g. Canada; 53,54]. Questions regarding *operational* power include: How (and by whom) are *operational* rights on nature/NCP enforced (e.g. access, use, and responsibilities)? What conflicts around values arise regarding *operational* rights about nature/NCP? What are the transformative capacities of different rights structures and which values are mobilized in such processes?

Figure 2 emphasizes that the interaction between value-centered leverage points and power dimensions all relate to systems transformation. Inspired by Davelaar et al., [17]'s onion bulb metaphor, the figure represents the nested and hierarchical structure, emergent properties, and overall function of a specific system. As mentioned earlier, the leverage realms progress from shallower to deeper [7,15] and in Figure 2 are aligned with the value-centered leverage points. *Structural* and *discursive* power exert influence on all the leverage realms and thus also on the value-centered leverage points (See SM 1 for an example of such interactions in the context of payments for ecosystem services).

³ Here marginalization relates to the lack of various types of power by some actors. For example, not-so-visible marginalization processes may occur due to limited access to knowledge, experience, and access to social networks. In each context, different constituencies become marginalized and layers of marginalization may occur within marginalized groups. Furthermore, marginalization is not a static process as power is constantly contested.

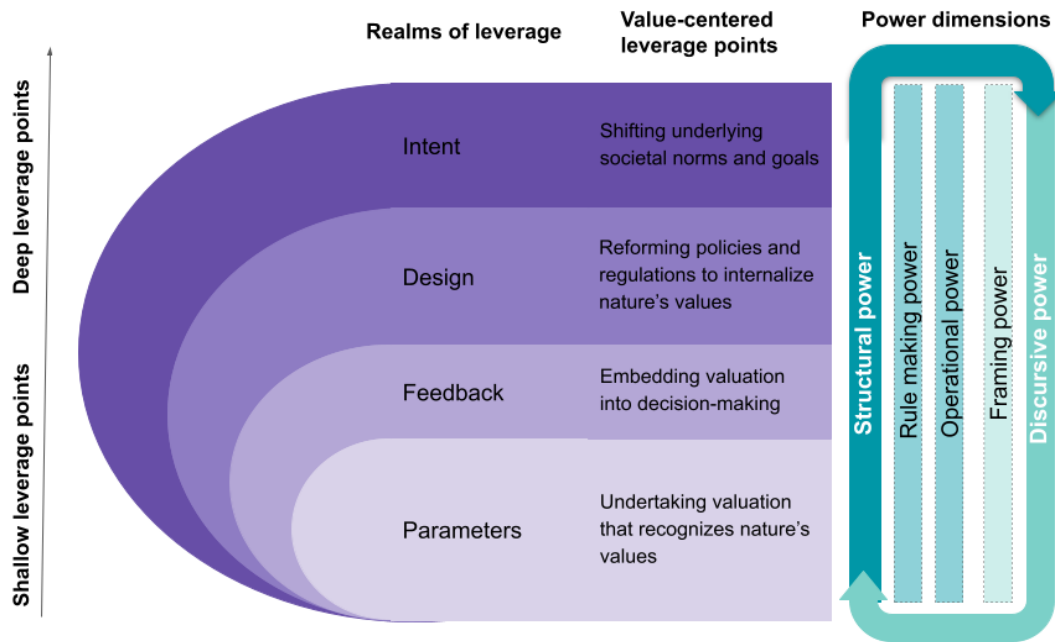


Figure 2. Relationships between systems layers, value-centered leverage points and power dimensions towards transformative changes.

3. How power challenges and catalyses values-centered leverage points

In this section, we illustrate how power can be exercised to block or foster transformative changes within each value-centered leverage point.

3.1. Undertaking valuation that recognizes the diverse values of nature

Valuation can be designed to help recognize multiple values of nature. Activating this leverage point requires marginalized actors to employ their own discourses around human-nature relationships or quality of life [55]. For example, concepts like ‘ecosystem services’ or ‘natural capital’ may act as *discursive* power devices that emphasize the elicitation of market-based instrumental values, while obscuring/changing other discourses and narratives associated with alternative worldviews and values (e.g. intrinsic and relational values) [56]. Hence, the *framing* dimension of power regarding valuation methods is important here [47,57]. For example, cost-benefit analysis may clash with non-utilitarian human-nature relationships and non-instrumental values [58]. Transformative valuation may draw on the 50 plus valuation methods and approaches identified by IPBES [29], in addition to those developed ad-hoc by local actors, that can be used to capture a diversity of knowledge systems, worldviews, and values [35].

To address *structural* power related to, inter alia, colonialist, racist, casteist, and patriarchal relations, as well as other forms of asymmetries (e.g., economic, epistemic, geographical, related to access to resources, abilities or social networks), reflexive approaches are needed to address how valuation processes are part of power dynamics [2,59]. For example,

valuation results can be excluded from the decision-making architecture or can be co-opted towards elites' own interests, due to power structures in place [59]. Researchers themselves enact power within the valuation process [60], as when they define the valuation purpose, the methods to be used, who can participate, and in which specific role (*rule-making* power) [11,47]. Indeed, the IPBES *Values Assessment* reviewed valuation studies and found that they only weakly account for future generations, the values of non-human entities, power asymmetries, and other knowledge systems. Meaningful participation and influence of participants in valuation processes are also scarce [35]. These results are not specifically related to the valuation field, but rather reflect the dominant worldviews and goals of the current system. While valuation is not the only factor that can influence decision-making, researchers and practitioners can, in the way they frame valuations, play a significant role in amplifying diverse worldviews, values, and knowledges, expanding the informational basis that supports decisions. Pro-transformative valuation processes can integrate transdisciplinary and co-design approaches, involving actors in every stage, and ensuring equal footing for marginalized groups [61].

3.2. Embedding valuation into decision-making

Embedding valuation into decision-making is crucial for creating inclusive and valid processes that represent the diversity of actors' values [2,5]. However, such processes are hindered by discourses that delegitimize marginalized actors' worldviews, knowledges and values, which suppress their influence in decision-making. For example, when Indigenous peoples' and local communities' (IPLC) knowledge systems are excluded from decision-making because they are viewed as anti-scientific, superstitious, or in need of validation by western science [62], which configures an epistemic injustice [13]. Further, selecting a particular policy or management instrument may exercise a *framing* power [47]. For example, the Common Agricultural Policy implemented by the European Union in 1962 initially prioritized economic gain and food production, neglecting biodiversity and local cultural values. This approach resulted in significant negative consequences such as habitat destruction, food overproduction, intensified farming practices, and the decline of farming cultural values [63]. In response, in 2003 the policy incorporated environmental and biodiversity values [64], although with varied biodiversity impacts across Europe [65]. In this sense, if policies and instruments are to foster transformative changes, they need to be aware of epistemic injustices and thus allow for the inclusion of non-hegemonic worldviews, knowledge systems, and values in decision-making [13,49].

Decision-making is influenced by *structural* power. For example, in a water management system in India, although people from different groups were on the decision-making committee, the values of people from marginalized castes were suppressed by people from the more powerful caste group [66]. States and governments are relevant actors that exercise *rule-making* power [67]. Diverse examples of governmental *rule-making* power include reforming laws towards environmental protection (e.g. [68]) or creating laws that favor corporations and profit-seeking (instrumental monetary values) vs ecosystems integrity (intrinsic value) or justice (broad value) [69]. Importantly, governments' *rule-making* power

(e.g. the judiciary) can counteract the exclusion of marginalized actors' values for transformative change [50]. This was exemplified in the bauxite mining conflict at Niyamgiri mountain in India, where the Supreme Court mandated the inclusion of Indigenous people in decision-making. As a result, IPLCs could exert their operational power by unanimously rejecting the proposed mining project through a referendum [50,58].

3.3. Reforming policies and regulations to internalize nature's values into decisions

Reforming policies and regulations that reflect the diverse values of nature is needed so that the worldviews and sustainability-aligned values of less powerful actors are taken into account [6]. However, powerful actors can propel their own discourses to promote the *status quo* and limit transformative change. For example, *discursive* power has been used via a universalist 'inefficiency' discourse to downplay community-based management [70] oriented by values such as stewardship for nature. Further, *framing* policies as 'win-win' solutions can hinder transformative change by obscuring value conflicts [71]. Value conflicts exist, for example, in both the conceptualization and implementation of the UN' Sustainable Development Goals (e.g. SDG 8 economic growth vs SDG 12 responsible consumption) [72]. Value conflicts may also be obscured by regulatory processes hinge on unenforced measures for "mitigating" value losses (e.g. biodiversity)[53]. Reforming policies and regulations to internalize nature's values would require recognizing the opportunities (and challenges) provided by the mobilization of alternative discourses and framings that: i) favor the integration of multiple values in policy design and reformation (e.g. co-management, multifunctional landscapes, biocultural diversity) and that ii) bring trade-offs and values conflicts to the front (e.g. degrowth).

The role of governments' *structural* power in catalyzing this leverage point is crucial because it can downplay or support reforms that articulate the values of nature. For example, land reforms in countries like Bulgaria and México that changed collective rights based on shared values of land to individual rights based on instrumental values (*rule-making* power), have contributed in some contexts to land abandonment and the erosion of traditional land-use knowledges, practices, and values [73,74]. Or conversely, governments can secure customary property rights systems of IPLC to govern environmental resources based on their worldviews and values (*operational* power) [75]. Changes in *structural* power can be reconfigured through the actions and social pressure of grassroots movements, NGOs, and academia [33,42]. For example, the integration of the *Buen vivir* philosophy and the rights of nature in the Bolivian and Ecuadorian constitutions was influenced by the creation of a subaltern electoral coalition that included Indigenous representatives [76]. This led to Indigenous voices being represented in parliament (*rule-making* power), although *operational* power is still poorly transferred to Indigenous peoples [77].

3.4. Shifting underlying societal norms and goals

Deep changes to the *status quo* require holistic local and global measures of quality of life while abandoning discourses that closely associate progress using macroeconomic indicators such as GDP, which is based on ever-increasing material consumption and

investment through the market system [5]. This discourse has been used to delegitimize lifestyles of IPLC as ‘undeveloped,’ favoring uncritical pro-growth policies and a worldview on human-nature relationships disconnected from actual relationships with the land and embodied practices [78]. This worldview is supported by the *framing* power of ideological approaches to measuring progress which privilege market-based instrumental values of nature and thus reduce nature to a factory of raw materials needed to produce goods and services. Philosophies of good living rooted, inter alia, in localized non-dominant traditions, can be mobilized in *discursive* strategies to contradict mainstream economic development discourses (e.g. *Buen vivir* among Indigenous people of South America, *Mino-bimaadiziwin* among Anishinaabeg (Ojibwe) and *Mino-pimatisiwin* among Inninuwak (Cree) in North America, *Ubuntu* in Sub-Saharan Africa, religion or sacrality-based environmental worldviews, such as Shinto in Japan, as well as social movements like degrowth, ecovillages, eudaemonic philosophies, communities inspired by feminist care ethics and others [79]. Although the sustainability and just implications of these philosophies and worldviews are context-specific, they tend to associate a good quality of life with broad values that guide human-human and human-nature interconnections (e.g. reciprocity, harmony, respect, solidarity, responsibility, place-based identities, kinship with nature, and self-determination) [80].

Advancing towards just and sustainable futures requires changing social norms that support injustices and unsustainable practices. For example, air travel has been regarded as a symbol of social status and a means to align with a desired social class which results in a lifestyle habit [e.g. Norway; 81]. Changing social norms occurs through social and political struggle and through countercultural movements that challenge dominant norms. It is part of the process by which historically disenfranchised groups gain *rule-making* power, and by which this power can become *operational*. For example, in Spiti Valley, India, marginalized castes have gained access to land through a land reform which also contributed to changing the social norms regarding their legitimization as decision-makers in some agricultural and water-related matters [82]. The efforts of IPLCs (e.g. smallholder farmers in the Global South, women, youth, and children) mobilizing against unjust and unsustainable projects, and demanding participation in environmental decision-making are essential forces toward transformative change.

Based on the above discussion, Figure 3 presents examples of power-related actions across value-centered leverage points and power dimensions towards transformative changes.

Figure 3. Examples of value-centered leverage points across and power dimensions towards transformative change*⁺

Value-centered leverage point	Example of discursive power oriented actions	Example of structural power oriented actions
Undertaking valuation	Use valuation methods that favor the inclusion of the worldviews and values regarding human-nature relationships and quality of life of marginalized actors (F)	Integrate transdisciplinary and co-design approaches, involving actors in every stage of the valuation process, and ensuring equal footing for marginalized groups (S)
Embedding valuation into decision-making	Design policy instruments based on knowledge co-production processes that integrate marginalized knowledge systems (D)	Create/support legal rules that protect marginalized actors worldviews, knowledge systems and values within decision-making processes (e.g. veto power regarding project developments) (R)
Reforming policies and regulations	Mobilize alternative discourses and framings that favor the integration of multiple values in policy design and reformation and that bring trade-offs and values conflicts to the front (e.g. co-management, degrowth, biocultural diversity) (D)	Support grassroots movements, advocacy, and popular education spaces (O)
Shifting societal norms and goals	Mobilize philosophies of good living; use local and global measures of quality of life while abandoning discourses that associate progress with Gross Domestic Product. (D, F)	Support social and political struggle and countercultural movements that challenge dominant norms (O)

*D: discursive power, F: framing, S: Structural, R: rule-making, O: Operational.

+See [82] for other value-centered leverage points from a justice perspective.

4. Conclusions

This paper highlights the complex interlinkages between the different dimensions of power and political decision-making given the diversity of values of nature. The typology of power puts forward aids in understanding the various ways in which power is central to legitimize certain human-nature relationships and the dominance of some values over others. The paper offers some perspectives for environmental policy-making. Policymakers need to consider the different power relations that explicitly or implicitly mediate the link between policy design, intervention, and its outcomes. For example, when different actors are able to effectively lobby for alternative policy options this implies that structural power dominates, but also that discursive and framing power can modulate such lobbying, by focusing on the potential outcomes such as the effects on marginalized actors whose voices are not duly represented.

More generally, this power typology helps to elucidate how different forms of power is exercised in different contexts and how it can be challenged (or catalysed) through: 1) applying valuation methods that ensure procedural and recognitional justice by legitimizing diverse values held by actors, 2) uptaking the results of inclusive valuation processes into more participatory decision-making that challenges the *status quo* underpinned by power asymmetries; 3) institutionalizing inclusive and just valuation processes 4) promoting

shifting societal norms and goals toward values aligned with justice and sustainability. This typology of power can also illuminate the enabling quality of power itself by guiding our attention to the institutions and decision-making processes that need to be transformed to truly integrate nature's diverse values into decisions, particularly those held by marginalized actors, in the co-creation of just and sustainable futures.

Supplementary Material 1.

Payments for ecosystem services (PES): Interactions of power dimensions and value-centered leverage points

Initially, PES were conceptualized and implemented from a utilitarian, anthropocentric and market-based discourse on human-nature relationships (intent realm) and which the main objective was the efficient provision of ecosystem services (design realm) (Bennett & Gosnell, 2015; Bremer et al., this issue). This conceptualization of PES was heavily influenced by economists and international development agencies (*structural* and *rule-making* power) (Bremer et al. this issue). Guidelines and metrics (parameters realm), including ecosystem service measurements, opportunity costs, as well as those that could help monitoring, were rapidly integrated into the design and implementation of PES programs (feedback realm). These metrics exerted a *framing* power by, for example, reinforcing program objectives and expected outcomes and emphasizing instrumental (normally via monetary values) while downplaying relational (livelihoods, social cohesion) and intrinsic values. Furthermore, PES programs began to be implemented generally in a top-down approach (*rule-making* power) recognizing as the most valid knowledge being that linked to technical knowledge and expertise (*discursive* power), while excluding other types of knowledge (e.g. Indigenous and local knowledge) (Bremer et al., this issue). PES developers, thus, exercised *operational* power by identifying potential participants, determining which costs and benefits to measure, and establishing how access to ecosystem services is distributed. In some cases, this PES approach has negatively impacted participant communities' knowledge and practices, social cohesion, food sovereignty, and biodiversity (Bremer et al., this issue).

Both academics and local actors have contested the conceptualization and implementation of early PES approaches (*operational* power) (Bremer et al., this issue) and in response, some PES programs have favored processes of co-design and implementation together with local actors, and thus acknowledging and integrating local knowledge and values (value-centered leverage point-VLP1: Undertaking valuation that recognizes nature values, VLP2 embedding valuation into decision making). Through mobilizations and protests (*operational* power), local actors have also pushed for the inclusion of broad values, such as justice (*rule-making* power; VLP3: reforming policies and regulations) (Bremer et al., this issue). PES programs thus now tend to focus as much on technical aspects as on issues associated with power disputes, in which local actors also (de)construct PES rules and norms (*operational* power) to adapt PES to their context. In these processes, actors have mobilized discourses (*discursive* power) to challenge the implicit goals and social norms of PES (VLP4 shifting underlying goals and norms). For instance, they have emphasized

reciprocity and collective action over individualistic market-based exchanges (Bremer et al., this issue).

References SM

- Bennett, D. E., & Gosnell, H. (2015). Integrating multiple perspectives on payments for ecosystem services through a social–ecological systems framework. *Ecological Economics*, 116, 172–181. doi:10.1016/j.ecolecon.2015.04.019
- Bremer L, Nelson S, Jackson S, Izquierdo-Tort S, Lansing D, Shapiro-Garza E, Echavarría M, Upton C, Asquith N, Isyaku U, Asiyanbi A, He, J, Pascual U. Embedding local values in Payments for Ecosystem Services for transformative change. *Current Opinion in Environmental Sustainability* (this issue).

References Article

[1] Intergovernmental Science-Policy Platform on Biodiversity and Ecosystem Services. Summary for Policymakers of the *Global Assessment Report on Biodiversity and Ecosystem Services* of the Intergovernmental Science-Policy Platform on Biodiversity and Ecosystem Services (IPBES). Zenodo; 2019.

[2] Intergovernmental Science-Policy Platform on Biodiversity and Ecosystem Services. Summary for Policymakers of the *Methodological Assessment of the Diverse Values and Valuation of Nature* of the Intergovernmental Science-Policy Platform on Biodiversity and Ecosystem Services (IPBES). Zenodo; 2022. <http://dx.doi.org/10.5281/ZENODO.6522392>

**Summary for Policymakers of the IPBES *Values Assessment*. The report provides a values perspective on how to balance people's good quality of life with all life on Earth. It provides a values typology, guidelines for nature valuation, and strategies for embedding values into decision-making. It also presents four value-centered leverage points toward transformative changes.

[3] Pörtner H.-O, Scholes R J, Arneth A, Barnes DKA, Burrows MT, Diamond SE, Duarte CM, Kiessling W, Leadley P, Managi S, McElwee P, Midgley G, Ngo HT, Obura D, Pascual U, Sankaran M, Shin YJ, Val AL. Overcoming the coupled climate and biodiversity crises and their societal impacts. *Science*. 2023;380(6642):eab14881. <http://dx.doi.org/10.1126/science.abl4881>

[4] Barton D.N., Chaplin-Kramer R., Lazos E., Van Noordwijk M., Engel S., Girvan A., Hahn T., Leimona B., Lele S., Niamir A., Özkaynak B., Pawlowska-Mainville A., Muradian R., Ungar P., Aydin C., Iranah P., Nelson S., Cantú-Fernández M., González-Jiménez D. (2022). Chapter 4. Value expression in decision-making [Internet]. Zenodo; 2022.

<http://dx.doi.org/10.5281/ZENODO.6522261>. Balvanera P, Pascual U, Christie M, Baptiste B, González-Jiménez D.(eds). IPBES secretariat, Bonn, Germany. <https://doi.org/10.5281/zenodo.6522261>

*This *Values Assessment* chapter addresses the link between nature's diverse values and decision-making and its outcomes. It addresses the causes of why nature is ignored in economic, political, and sociocultural decisions and describes how to transform drivers of nature degradation.

[5] Pascual et al. 2023. Diverse values of nature for sustainability. *Nature*. Forthcoming.

[6] Pascual U, McElwee PD, Diamond SE, Ngo HT, Bai X, Cheung WWL, Lim M, Steiner N, Agard J, Donatti CI, et al. Governing for transformative change across the biodiversity–climate–society nexus. *BioScience*. 2022;72(7):684–704. <http://dx.doi.org/10.1093/biosci/biac031>

[7] Abson DJ, Fischer J, Leventon J, Newig J, Schomerus T, Vilsmaier U, Abernethy P, Ives CD, Jager NW, Lang DJ. Leverage points for sustainability transformation. *Ambio*. 2017;46(1):30–9. <http://dx.doi.org/10.1007/s13280-016-0800-y>

[8] Horcea-Milcu A-I, Abson DJ, Apetrei CI, Duse IA, Freeth R, Riechers M, Lam D, Dorninger C, Lang D. Values in transformational sustainability science: four perspectives for change. *Sustain Sci*. 2019;14(5):1425–37.: <http://dx.doi.org/10.1007/s11625-019-00656-1>

**Provides four general perspectives of how values are important for transformative changes: i) critical reflection on normative assumptions, ii) negotiating values, iii) eliciting values, and iv)transforming through values. The paper provides insights into how to operationalize values in different contexts.

[9] Riechers M, Loos J, Balázs Á, García-Llorente M, Bieling C, Burgos-Ayala A, Chakroun L, Mattijssen TJM, Muhr MM, PérezRamírez I, Raatikainen KJ, Rana S, Richardson M, Rosengren L, West S. Key advantages of the leverage points perspective to shape human-nature relations. *Ecosyst People (Abingdon)* [Internet]. 2021;17(1):205–14. <http://dx.doi.org/10.1080/26395916.2021.1912829>

[10] Harmáčková ZV, Yoshida Y, Sitas N, Mannetti L, Martin A, Kumar R, Berbés-Blázquez M, Collins R, Eisenack K, Guimaraes E, Heras M, Nelson V, Niamir A, Ravera F, Ruiz-Mallen I, O'Farrell P. The role of values in future scenarios: What types of values underpin (un)sustainable and (un)just futures? *Current Opinion in Environmental Sustainability* (this issue), 2023.

[11] Anderson CB, Athayde S, Raymond CM, Vatn A, Arias-Arévalo P, Gould RK, Kenter J, Muraca B, Sachdeva S, Samakov A, et al. Chapter 2. Conceptualizing the diverse values of nature and their contributions to people. Zenodo; 2022. <http://dx.doi.org/10.5281/ZENODO.7701874>

*Provides a value typology that facilitates the understanding of the different conceptualizations and expressions of nature's diverse values and how to incorporate them into governance frameworks.

[12] Raymond C, Anderson CB, Athayde S, Vatn A, Amin AM, Arias-Arévalo P, Christie M, Cantú-Fernández M, Gould R, Himes A, et al. An inclusive values typology for navigating transformations toward a just and sustainable future. Manuscript submitted to Current Opinion in Environmental Sustainability (COSUST). Special Issue: Leveraging the multiple values of nature for transformative change: Insights from the IPBES Values Assessment. Call 2023.

[13] Lenzi et al, this issue. Justice, sustainability, and the diverse values of nature: why they matter for biodiversity conservation. Manuscript submitted to Current Opinion in Environmental Sustainability (COSUST). Special Issue: Leveraging the multiple values of nature for transformative change: Insights from the IPBES Values Assessment. Call 2023.

**This paper clarifies key conceptions of justice regarding the diverse values of nature. It presents how different dimensions of justice are interconnected in the context of sustainability transformations. It also presents examples of actions aimed at each dimension of justice (recognition, procedural, distributive) and each value-centered leverage point. Such actions and in themselves power reconfigurations.

[14] Woiwode C, Schöpke N, Bina O, Veciana S, Kunze I, Parodi O, Schweizer-Ries P, Wamsler C. Inner transformation to sustainability as a deep leverage point: fostering new avenues for change through dialogue and reflection. *Sustain Sci*. 2021;16(3):841–58. <http://dx.doi.org/10.1007/s11625-020-00882-y>

[15] Meadows D. Leverage points: Places to intervene in a system. The Sustainability Institute; 1999.

[16] Meadows D. Dancing with systems. Whole earth. The Donella Meadows Project, a project of the Academy for Systems Change. 2001. <https://donellameadows.org/archives/dancing-with-systems/>

[17] Davelaar D. Transformation for sustainability: a deep leverage points approach. *Sustain Sci* 16, 727–747 (2021). <https://doi.org/10.1007/s11625-020-00872-0>

[18] Martin A, O'Farrell P, Kumar R, Eser U, Faith DP, Gomez-Baggethun E, E., Harmackova Z, Horcea-Milcu AI, Merçon J, Quaas M, Rode J, Rozzi R, Sitas N, Yoshida Y, Ochieng TN, Koessler A-K, Lutti N, Mannetti L, Arroyo-Robles G. Chapter 5. The role of diverse values of nature in visioning and transforming towards just and sustainable futures. 2022, Zenodo. <http://dx.doi.org/10.5281/ZENODO.6522326>.

**This *Values Assessment* chapter assesses the role of nature's diverse values in supporting transformative changes toward justice and sustainability. It assesses the diverse values that have been considered in sustainable future studies and presents four value-oriented

leverages to catalyse transformative change. It explores the role of values and valuation in four pathways: green economy, degrowth, Earth stewardship, and nature protection

[19] Pascual U, Balvanera P, Christie M. Leveraging the multiple values of nature for transformative change: Insights from the IPBES Values Assessment. *Current Opinion in Sustainability*. Special Issue. Call 2023.

[20] De Groot JIM, Steg L. Mean or green: which values can promote stable pro-environmental behavior? *Conserv Lett* [Internet]. 2009;2(2):61–6. <http://dx.doi.org/10.1111/j.1755-263x.2009.00048.x>

[21] Visseren-Hamakers IJ, Razzaque J, McElwee P, Turnhout E, Kelemen E, Rusch GM, Fernández-Llamazares Á, Chan I, Lim M, Islar M, Gautam AP, Williams M, Mungatana E, Karim MS, Muradian R, Gerber LR, Lui G, Liu J, Spangenberg J H, Zaleski D. Transformative governance of biodiversity: insights for sustainable development. *Curr Opin Environ Sustain*. 2021;53:20–8. <http://dx.doi.org/10.1016/j.cosust.2021.06.002>

* The paper describes presents four dimensions of transformative governance that need to be implemented simultaneously: integrative (across scales, places, issues and sectors); inclusive of marginalized voices and sustainability-aligned values; adaptive, adaptive to face the complexity of transformations, and pluralist in terms of recognizing diverse knowledge systems.

[22] Patterson J, Schulz K, Vervoort J, van der Hel S, Widerberg O, Adler C, Hurlbert M, Anderton K, Sethi M, Barau A. Exploring the governance and politics of transformations towards sustainability. *Environ Innov Soc Transit*. 2017;24:1–16. <http://dx.doi.org/10.1016/j.eist.2016.09.001>

[23] Swyngedouw E. Apocalypse forever? *Theory Cult Soc*. 2010;27(2–3):213–32. <http://dx.doi.org/10.1177/0263276409358728>

[24] Avelino F. Power in Sustainability Transitions: Analysing power and (dis)empowerment in transformative change towards sustainability: Power in Sustainability Transitions. *Environ Pol Gov*. 2017;27(6):505–20. <http://dx.doi.org/10.1002/eet.1777>

**Develop a framework to analyze power and (dis)empowerment in transformative social change, based on different interpretations of power/empowerment. Provides a useful classification of power (reinforcive, innovative, transformative) for transition scholars.

[25] Avelino F. Theories of power and social change. Power contestations and their implications for research on social change and innovation. *J Polit Power*. 2021;14(3):425–48. <http://dx.doi.org/10.1080/2158379x.2021.1875307>

**The paper proposes a framework for studying the complexity of the notion of power in processes of change and innovation. Provides useful empirical questions to guide research on power and social change.

[26] Ishihara H, Pascual U, Hodge I. Dancing with storks: The role of power relations in payments for ecosystem services. *Ecol Econ.* 2017;139:45–54. <http://dx.doi.org/10.1016/j.ecolecon.2017.04.007>

[27] Foucault M. *Discipline and punish: The birth of the prison*. New York, NY: Pantheon Books; 1977.

[28] Radkau J. Nature and power: An intimate and ambiguous connection. *Soc Sci Hist.* 2013;37(3):325–45. <http://dx.doi.org/10.1017/s0145553200014243>

[29] Termansen M, Jacobs S, Mwampamba TH, SoEun A, Castro Martínez AJ, Dendoncker N, Ghazi H., Gundimeda H., Huambachano M., Lee H, et al. Chapter 3. The potential of valuation. Zenodo; 2022. <http://dx.doi.org/10.5281/ZENODO.6521298>

*This *Values Assessment* chapter develops a systematic literature review providing empirical evidence on how valuation methods frame human-nature relationships and values.

[30] Avelino F, Rotmans J. Power in transition: An interdisciplinary framework to study power in relation to structural change. *Eur J Soc Theory.* 2009;12(4):543–69. <http://dx.doi.org/10.1177/1368431009349830>

[31] Scoones I, Leach M, Newell P. (Eds.). *The Politics of Green Transformations*. 2015. Routledge (Pathways to Sustainability), London.

[32] Avelino F, Grin J, Pel B, Jhagroe S. The politics of sustainability transitions. *J. Environ. Policy Plan*, 2016; 18 (5), 557–567. <https://doi.org/10.1080/1523908X.2016.1216782>.

[33] Raj G, Feola G, Hajer M, Runhaar H. Power and empowerment of grassroots innovations for sustainability transitions: A review. *Environ Innov Soc Transit.* 2022;43:375–92. <http://dx.doi.org/10.1016/j.eist.2022.04.009>

**Based on a systematic literature review, the paper presents the state-of-the-art regarding how power and empowerment have been analyzed in the context of grassroots movements for transformative changes. It also provides a power typology.

[34] Horcea-Milcu A-I. Values as leverage points for sustainability transformation: two pathways for transformation research. *Curr Opin Environ Sustain.* 2022;57(101205):101205. <http://dx.doi.org/10.1016/j.cosust.2022.101205>

[35] Schaafsma M, Ahn S, Castro AJ, Dendoncker N, Filyushkina A, González-Jiménez D, Huambachano M, Mukherjee N, Mwampamba TH, Ngouhouo-Poufoun J, Palomo I, Pandit R, Termansen M, Ghazi H, Jacobs S, Lee H, Contreras V. Whose values count? A review of the nature valuation studies with a focus on justice. *Current Opinion in Environmental Sustainability* (this issue); 2023.

- [36] Balvanera P, Pascual U, Christie M, Baptiste B, Guibrunet L, Lliso B, Monroy-Sais AS, Anderson C, Athayde S, Barton D, et. al. Chapter 1. The role of the values of nature and valuation for addressing the biodiversity crisis and navigating towards more just and sustainable futures (Version 08). 2022. Zenodo. <https://doi.org/10.5281/zenodo.7701873>
- [37] Svarstad H, Overå R, Benjaminsen T. Power theories in political ecology. *J Polit Ecol.* 2018;25(1):350. <http://dx.doi.org/10.2458/v25i1.23044>
- [38] Raik D, Wilson A, Decker D. Power in natural resources management: An application of theory. *Soc Nat Resour.* 2008;21(8):729–39. <http://dx.doi.org/10.1080/08941920801905195>
- [39] Epstein G., Bennett A., Gruby R., Acton L., Nenadovic M. Studying power with the social-ecological system framework. *Understanding Society and Natural Resources*, eds Manfredo MJ, Vaske JJ, Rechkemmer A, Duke EA. Springer, Netherlands; 2014, pp 111–135.
- [40] Stör L. Theories of Power. In: *Routledge Handbook of Ecological Economics*. Abingdon, Oxon ; New York, NY : Routledge, 2017.: Routledge; 2017. p. 141–51.
- [41] Bennett A, Acton L, Epstein G, Gruby RL, Nenadovic M. Embracing conceptual diversity to integrate power and institutional analysis: Introducing a relational typology. *Int J Commons.* 2018;12(2):330. <http://dx.doi.org/10.18352/ijc.819>
- [42] Kashwan P, MacLean LM, García-López GA. Rethinking power and institutions in the shadows of neoliberalism. *World Dev.* 2019;120:133–46. <http://dx.doi.org/10.1016/j.worlddev.2018.05.026>
- [43] Foucault, M. Governmentality. In *The Foucault Effect: Studies in Governmentality*, eds. G. Burchell, C. Gordon, and P. Miller. Chicago: University of Chicago Press; 1991.
- [44] Feindt PH, Oels A. Does discourse matter? Discourse analysis in environmental policy making. *J Environ Policy Plann.* 2005;7(3):161–73. <http://dx.doi.org/10.1080/15239080500339638>
- [45] Linnell JDC, Kaczensky P, Wotschikowsky U, Lescureux N, Boitani L. Framing the relationship between people and nature in the context of European conservation: Relationship Between People and Nature. *Conserv Biol.* 2015;29(4):978–85. <http://dx.doi.org/10.1111/cobi.12534>
- [46] Lliso B, Arias-Arévalo P, Maca-Millán S, Engel S, Pascual U. Motivational crowding effects in payments for ecosystem services under alternative value frames: Instrumental versus relational values. *SSRN Electron J.* 2021. <http://dx.doi.org/10.2139/ssrn.3878138>
- [47] Vatn A. Rationality, institutions and environmental policy. *Ecol Econ.* 2005;55(2):203–17. <http://dx.doi.org/10.1016/j.ecolecon.2004.12.001>

- [48] Arias-Arévalo P, Martín-López B, Gómez-Baggethun E. Exploring intrinsic, instrumental, and relational values for sustainable management of social-ecological systems. *Ecol Soc.* 2017;22(4). <http://dx.doi.org/10.5751/es-09812-220443>
- [49] Chaplin-Kramer R, Neugarten R., Gonzalez-Jimenez D., Ahmadi G., Baird T.D., Crane N., Delgoulet E., Eyster H.N., Kurashima N., Llopis J.C, Millington A., Pawlowska-Mainville A., Rulmal, J., Saunders F., Shrestha S., Vaughan M., Winter K., Wongbusarakum S. Pascual U. Transformation for inclusive conservation: evidence on values, decisions, and impacts in protected areas. *Current Opinion in Environmental Sustainability* (this issue); 2023.
- [50] Lele S, Del Bene D, Avci D, Roa-Avendaño T, Roy B, Sahu G, Harris M, Moore D. Values and Knowledge in Decision-making on Environmentally Disruptive Infrastructure Projects. *Current Opinion in Environmental Sustainability* (this issue); 2023.
- [51] Vatn A. *Environmental governance: Institutions, policies and actions*. Cheltenham, England: Edward Elgar Publishing; 2015.
- [52] Ostrom E. *Understanding institutional diversity*. Princeton, NJ: Princeton University Press; 2005.
- [53] Collard R-C, Dempsey J, Holmberg M. Extirpation despite regulation? Environmental assessment and caribou. *Conserv Sci Pract.* 2020;2(4). <http://dx.doi.org/10.1111/csp2.166>
- [54] Hunsberger CA, Gibson RB, Wismer S K. Citizen involvement in sustainability-centred environmental assessment follow-up. *Environ Impact Assess Rev.* 2005;25(6):609–27. <http://dx.doi.org/10.1016/j.eiar.2004.12.003>
- [55] Riedy C. Discourse coalitions for sustainability transformations: common ground and conflict beyond neoliberalism. *Curr Opin Environ Sustain.* 2020;45:100–12. <http://dx.doi.org/10.1016/j.cosust.2020.09.014>
- [56] Muradian R, Gómez-Baggethun E. Beyond ecosystem services and nature's contributions: Is it time to leave utilitarian environmentalism behind? *Ecol Econ.* 2021;185(107038):107038. <http://dx.doi.org/10.1016/j.ecolecon.2021.107038>
- [57] Tadaki M, Sinner J, Šunde C, Giorgetti A, Glavovic B, Awatere S, et al. Four propositions about how valuation intervenes in local environmental politics. *People Nat* (Hoboken). 2021;3(1):190–203. <http://dx.doi.org/10.1002/pan3.10165>
- [58] Temper L, Martinez-Alier J. The god of the mountain and Godavarman: Net Present Value, indigenous territorial rights and sacredness in a bauxite mining conflict in India. *Ecol Econ.* 2013;96:79–87. <http://dx.doi.org/10.1016/j.ecolecon.2013.09.011>
- [59] Jacobs S., Kelemen E., O'Farrell P., Martin A., Schaafsma, M., Dendoncker N., Pandit R., Heita Mwampamba. T., Palomo I., Castro A., Analí Huambachano M., Filyushkina A.,

Gunimeda H., The pitfalls of plural valuation. *Current Opinion in Environmental Sustainability* (this issue).

[60] Schröter M, Crouzat E, Hölting L, Massenberg J, Rode J, Hanisch M, Kabisch N, Palliwoda J, Priess JA, Seppelt R, et al. Assumptions in ecosystem service assessments: Increasing transparency for conservation. *Ambio*. 2021;50(2):289–300. <http://dx.doi.org/10.1007/s13280-020-01379-9>

[61] Norström AV, Cvitanovic C, Löf MF, West S, Wyborn C, Balvanera P, Bednarek AT, Bennett EM, Biggs R, de Bremond A, et al. Principles for knowledge co-production in sustainability research. *Nat Sustain*. 2020;3(3):182–90. <http://dx.doi.org/10.1038/s41893-019-0448-2>

[62] Wheeler HC, Danielsen F, Fidel M, Hausner V, Horstkotte T, Johnson N, et al. The need for transformative changes in the use of Indigenous knowledge along with science for environmental decision-making in the Arctic. *People Nat* (Hoboken). 2020;2(3):544–56. <http://dx.doi.org/10.1002/pan3.10131>

[63] Bignal E, Jones G, McCracken DI. Comment: future directions in agriculture policy and nature conservation. *Br. Wildlife*. 2001, 13, 16–20.

[64] Henle K, Alard D, Clitherow J, Cobb P, Firbank L, Kull T, McCracken D, Moritz RF, Niemelä J, Rebane M, Wascher D. Identifying and managing the conflicts between agriculture and biodiversity conservation in Europe—A review. *Agric Ecosyst Environ*. 2008;124(1–2):60–71. <http://dx.doi.org/10.1016/j.agee.2007.09.005>

[65] Pe'er G, Dicks LV, Visconti P, Arlettaz R, Báldi A, Benton TG, Collins S, Dieterich M, Gregory RD, Hartig F, Henle K. Agriculture policy. EU agricultural reform fails on biodiversity. *Science*. 2014;344(6188):1090–2. <http://dx.doi.org/10.1126/science.1253425>

[66] Mudliar P, Koontz T M. Locating Power in Ostrom's Design Principles: Watershed Management in India and the United States. *Society & Natural Resources*. 2021. 34(5), 639–658. doi:10.1080/08941920.2020.1864

[67] Penca J. Public authorities for transformative change: integration principle in public funding. *Biodivers Conserv*. 2023. <http://dx.doi.org/10.1007/s10531-023-02542-w>

[68] Zhang Q, Yu Z, Kong D. The real effect of legal institutions: Environmental courts and firm environmental protection expenditure. *J Environ Econ Manage*. 2019;98(102254):102254. <http://dx.doi.org/10.1016/j.jeem.2019.102254>

[69] Brisman A, McClanahan B, South N, Walters R. The politics of water rights: Scarcity, sovereignty and security. In: *Water, Governance, and Crime Issues*. Cham: Springer International Publishing; 2020. p. 17–29.

- [70] Gauld R. Maintaining centralized control in community-based forestry: Policy construction in the Philippines. *Dev Change*. 2000;31(1):229–54. <http://dx.doi.org/10.1111/1467-7660.00153>
- [71] McShane TO, Hirsch PD, Trung TC, Songorwa AN, Kinzig A, Monteferri B, Mutekanga D, Thang H, Dammert J, Pulgar-Vidal M, et al. Hard choices: Making trade-offs between biodiversity conservation and human well-being. *Biol Conserv*. 2011;144(3):966–72. <http://dx.doi.org/10.1016/j.biocon.2010.04.038>
- [72] Hickel J. The contradiction of the sustainable development goals: Growth versus ecology on a finite planet. *Sustain Dev*. 2019;27(5):873–84. <http://dx.doi.org/10.1002/sd.1947>
- [73] Hanaček K, Langemeyer J, Bileva T, Rodríguez-Labajos B. Understanding environmental conflicts through cultural ecosystem services - the case of agroecosystems in Bulgaria. *Ecol Econ*. 2021;179(106834):106834. <http://dx.doi.org/10.1016/j.ecolecon.2020.106834>
- [73] Schroeder NM, Castillo A. Collective action in the management of a tropical dry forest ecosystem: effects of Mexico's property rights regime. *Environ Manage* [Internet]. 2013;51(4):850–61. <http://dx.doi.org/10.1007/s00267-012-9980-9>
- [75] Broome NP, Bajpai S, Shende M. Forest rights act, local collectivisation and transformation in Korchi 1. In *Indigenous Knowledges and the Sustainable Development Agenda* (pp. 51-72). Routledge. 2020
- [76] Beling AE, Cubillo-Guevara AP, Vanhulst J, Hidalgo-Capitán AL. Buen vivir (good living): A “glocal” genealogy of a Latin American utopia for the world. *Lat Am Perspect*. 2021;48(3):17–34. <http://dx.doi.org/10.1177/0094582x211009242>
- [77] Lalander R. Rights of nature and the indigenous peoples in Bolivia and Ecuador: A Straitjacket for Progressive Development Politics? *Rev Iberoam Estud Desarro*. 2014;3(2). http://dx.doi.org/10.26754/ojs_ried/ijds.137
- [78] Escobar A. *Territorios de diferencia: Lugar, movimientos, vida, redes*. Universidad del Cauca; 2014.
- [79] Brand U, Muraca B, Pineault É, Sahakian M, Schaffartzik A, Novy A, Streissler C, Haberl H, Asaraf V, Dietz K, Lang M, Kothari A, Smith T, Spash C, Brad A, Pichler M, Planka C, Velegrakis G, Jahn T, Carter A, Hua Q, Kallis G, Martinez Alier J, Riva G, Satgar V, Teran-Mantovani E, Williams M, Wissensand M, Görge C. From planetary to societal boundaries: an argument for collectively defined self-limitation. *Sustain Sci Pract Policy*. 2021;17(1):264–91. <http://dx.doi.org/10.1080/15487733.2021.1940754>
- [80] Kothari A, Salleh A, Escobar A, Demaria F, Acosta A. *Pluriverse - A Post-Development Dictionary*. Tulika Book; 2019.

[81] Aasen M, Thøgersen J, Vatn A, Dunlap RE, Fisher DR, Hellevik O, Stern PC. The limited influence of climate norms on leisure air travel. *J Sustain Tour.* 2022;1–20. <http://dx.doi.org/10.1080/09669582.2022.2097687>

[82] Murali R, Bijoor A, Mishra C. Gender and the commons: water management in Trans-Himalayan Spiti Valley, India. *India Ecology, Economy and society-the INSEE Journal.* 2021;4:113–22.

[83] Bennett, D. E., & Gosnell, H. (2015). Integrating multiple perspectives on payments for ecosystem services through a social–ecological systems framework. *Ecological Economics*, 116, 172–181. doi:10.1016/j.ecolecon.2015.04.019

[84] Bremer LL, Nelson S, Jackson S, Izquierdo-Tort S, Lansing D, Shapiro-Garza E, Echavarría M, Upton C, Asquith N, Isyaku U, Asiyanbi A, He, J, Pascual U. Embedding local values in Payments for Ecosystem Services for transformative change. *Current Opinion in Environmental Sustainability* (this issue).

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