

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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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 socio-cultural 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 Singapore³ 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.

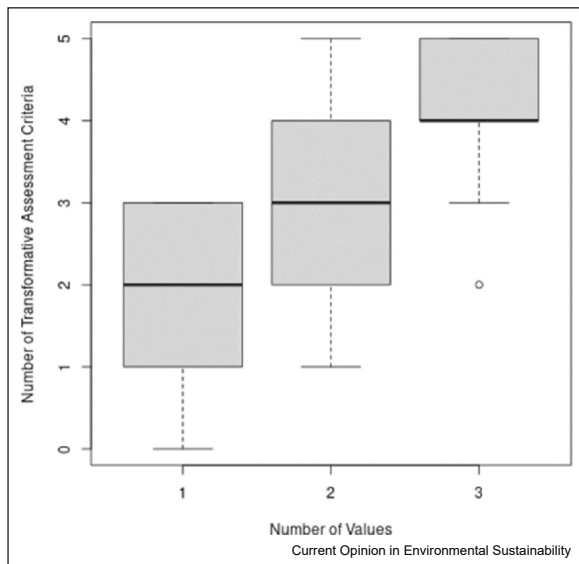
Table 1

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) <i>For example, alternative economic models</i>	1.7 2	0.9 2	0.9 2	0.5 1	0.9 2	Vested interests, overrepresentation of instrumental values, and high transaction costs impede the implementation of highly transformative solutions.	37.7%	[30,31]
Legal and regulatory (n = 13) <i>For example, rights of nature</i>	1.2 1	1.0 2	1.0 2	0.5 2	0.7 1	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]
Rights-based and customary (n = 4) <i>For example, other effective area-based conservation</i>	1.0 1	2.0 2	1.3 2	1.3 1	1.0 1	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]
Social and cultural (n = 7) <i>For example, comanagement regimes</i>	1.7 2	1.1 2	0.9 1	1.1 2	0.3 1	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]

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



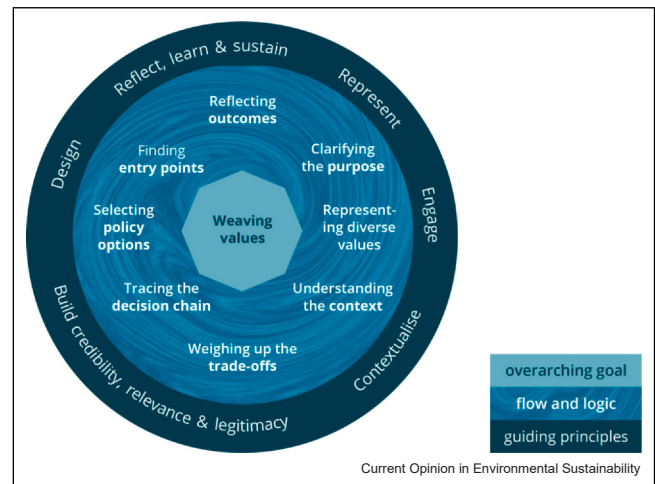
Median number of transformative change criteria associated with policy options of varying diversity ($n = 43$ case studies). Policy options that address one value are associated with a median of 1.9 (IQR 1–3) transformative change criteria, while those that address two or three values are associated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

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

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.

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/sub-continental) 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, socio-cultural 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?

References and recommended reading

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

- of special interest
- of outstanding interest.

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The paper consolidates the contributions of indigenous peoples and local communities toward the conservation of nature in multiple ways. Terming them as pathways, these range from direct conservation and restoration of biodiversity and ecosystems and their functions through territorial management practices, contributing through their expertise and knowledge to assessments and monitoring, resisting and countering drivers of unsustainable resource use and other injustices, participating in environmental governance activities from local to global scales, and offering alternative ways to conceive the interrelations between people and nature. Leveraging on these contributions of IPLCs would enable effective transitions to transformative changes toward sustainability.
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The paper emphasizes the need to weave different knowledge systems, including indigenous and traditional with others to ensure more sustainability-oriented governance and management of socio-ecological systems. Involving indigenous peoples and local communities in the process of colearning and coproduction of knowledge and solutions requires sensitive mobilization of different actors, translating the different knowledge across different systems, negotiating and deliberating on consequences, and further synthesizing and applying in decision-making.
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