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Knowing and unknowing transformative change: Epistemic inequities and epistemic justice in the IPBES transformative change assessment

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ABSTRACT

Calls for transformative change towards a just and sustainable world often discuss the role of paradigms and knowledge systems as levers for transformation. Yet, current knowledge practices can also obstruct transformation since research priorities reflect dominant interests in science, economy and society and dominant paradigms and knowledge systems, and marginalise alternative forms of knowledge. This situation posed a challenge for the Transformative Change Assessment of the Intergovernmental Panel on Biodiversity and Ecosystem Services (IPBES). This article reflects on how the assessment reported on existing inequities in the knowledge that was available for the assessment and discusses whether and how it was able to mitigate these existing inequities and pursue epistemic justice in the assessment process. Our findings point to a general dominance of positivist and natural science literature and an underrepresentation of alternative, pluralist, critical, relational, and Indigenous paradigms and knowledge systems. We also show that the assessment process was limited in its ability to mitigate these epistemic inequities and was unable to prevent epistemic injustices from occurring. These findings are related to a diversity of factors including limited diversity in the assessment team, rules and procedures of IPBES, and wider structural factors, including specific dominant norms and values of what good and credible knowledge is and of how assessments should be developed. All in all, we note a persistent unknowing of transformative change through the production of ignorance. We conclude by identifying options for transforming environmental research and global environmental assessments.

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1. Introduction

Calls for transformative change to ensure a just and sustainable world are on the rise. These calls have emerged from global environmental reports and assessments, including from the Intergovernmental Platform for Biodiversity and Ecosystem Services (IPBES) and the Intergovernmental Panel on Climate Change (IPCC). These reports and assessments highlight that current actions are insufficient to address the situation of accelerating and intersecting social and environmental crises, including biodiversity loss, climate change, and growing social inequality. They argue that addressing this polycrisis requires challenging and supplanting current political economic structures and transforming not only the policies, regulations, and practices that contribute to these intersecting crises but also those that are insufficiently effective in addressing them. In response to these calls, IPBES' plenary agreed in 2020 to undertake an assessment of the underlying causes of biodiversity loss, determinants of transformative change, and options for achieving the 2050 vision for biodiversity, hereafter called the Transformative Change Assessment. The assessment report, which was approved in December 2024, defines transformative change as a fundamental shift across views, structures and practices that addresses the underlying causes of biodiversity loss in ways that respect key principles of justice, pluralism, reciprocity and adaptive learning (Gurung et al., 2024). The assessment provides a synthesis of existing knowledge on the nature of and barriers to transformative change as well as on transformative visions and strategies.

As a synthesis of available knowledge, the Transformative Change Assessment inevitably reflects the knowledge that currently exists. This existing knowledge base can, however, not be taken as self-evident since underlying political, economic and social structures, norms, and institutions determine what knowledge is generated (or not), funded, accessible, or recognized as reliable or relevant. This means that the existing knowledge base is inevitably characterized by epistemic inequities, imbalances, and distortions in the sense that they are biased towards specific paradigms and knowledge systems,[1] themes, spaces, or methodologies while others remain underrepresented or absent (Frickel et al., 2010; The Global-Hub on Indigenous Peoples' Food Systems 2021). This situation is not only the result of inequities in access to funding or other resources, but also of prevalent norms of what constitutes reliable and relevant knowledge. In science, often priority is given to quantitative and positivist forms of research (Clarke et al., 2025; Frederiksen and Poulsen, 2025). As Hunter (2002, p. 130) argues, positivism tends to present its own assumptions as neutral and universal rather than as one epistemological position among others. This can then easily lead to a marginalisation of alternative, pluralist, critical, relational, and Indigenous paradigms and knowledge systems that have different understandings of reliable and rigorous knowledge, that are not based on colonial and modernist distinctions between subjects and objects, or that do not use extractivist methodologies (Quijano, 2007; Gebara et al., 2023;Massarella et al., 2022). Moreover, science tends to prioritise research on existing phenomena in pursuit of explaining patterns among what are considered to be singular, clearly delineated, and objectively observable entities.

These epistemic inequities in research matter because they affect what conclusions the assessment will draw and what options for action it will present to decision makers. This is one reason why IPBES assessment processes also identify and report on knowledge gaps. According to IPBES, knowledge gaps refer to "pieces of knowledge … that are absent or insufficient to fulfil the mandate of the assessment".[2] These can include research gaps and data gaps and can also refer to knowledge that can be assumed to exist but is not available to assessment experts. However, identifying such knowledge gaps is not a straightforward matter because it involves diverse understandings of knowledge and of why filling gaps matters (Hulme, 2018). This is related to the epistemic inequities discussed earlier since the he identification and analysis of knowledge gaps is inevitably influenced by the same underlying political, economic and social structures, norms, epistemic biases, and assumptions that also shape the available knowledge base. These form the frame in which knowledge gaps can become identifiable as missing pieces of the puzzle in the first place. Consequently, absences of those forms of knowledge that do not fit with prevalent framings of what counts as relevant knowledge are less likely to be noticed as knowledge gaps. This means that these knowledge gaps are structural and persistent. The structural character of knowledge gaps is further reinforced by the fact that many forms of knowledge – including oral traditions, grey literature from civil society, works authored by global South scholars not in mainstream journals, or placed-based knowledges - may not make it to the knowledge base that is used by such assessments.

While this tendency of dominant norms and values to reproduce themselves applies to all processes of knowledge (co-)production and synthesis, the issue of epistemic inequities requires special consideration for a global assessment of transformative change. After all, the knowledge that is needed to support transformative change is knowledge that can challenge powerful interests and support the supplanting of current dominant political and economic structures. And as the summary for policy makers of the IPBES Global Assessment of Biodiversity and Ecosystem Services already noted, this means that transformative change "can expect opposition from those with interests vested in the status quo" (IPBES, 2019, p 16). While this statement refers to public and private actors in society that can be expected to oppose transformative policies and measures, opposition also can be expected in research systems, institutions and actors. Research funding and priorities have historically tended to reflect and support the interests of powerful societal actors favoured by current structures (Turnhout and Lynch, 2025) and dominant actors in science resist and obstruct the transformation of science and research (Mervis and Pérez Ortega, 2024, Lahsen and Turnhout, 2021, Caniglia et al., 2021, Horcea-Milcu et al., 2024, Fazey et al., 2020, Turnhout and Lahsen, 2022).

The result of the dynamics discussed so far show not only that there is a lack of knowledge about transformative change but also that this lack is persistent and structural. McGoey (2019) has called this phenomenon of knowledge about specific issues structurally being not produced or dismissed the strategic production of ignorance. This ignorance can strengthen specific "rigid ideological positions and policy perspectives" that in turn further perpetuate the production of ignorance about alternatives (McGoey, 2019, p 12). In our case, as a result of a combination of power inequalities in who decides about research priorities, and dominant norms and paradigms of what constitutes good and credible knowledge, knowledge that is critically important for transformative change - knowledge that is derived from alternative, pluralist, critical, relational, and Indigenous paradigms and knowledge systems, that challenges existing political economic structures, that analyses power relations and dominant interests, and that develops and supports alternatives - can be expected to be in a marginalized position compared to research that supports dominant interests and reproduces existing structures.

This risk of marginalisation is also present in Global Environmental Assessments (GEAs). GEAs have historically focused on the natural sciences (Bennett et al., 2026) and, despite growing multidisciplinary aspirations and practices, social sciences and humanities and Indigenous and local knowledges remain underrepresented and/or co-opted into

[1] We use the phrasing of paradigms and knowledge systems to refer to more or less coherent assemblages of understandings of epistemology, ontology, and methodology. In Indigenous contexts, terms like worldview or cosmology are often used, and in academic contexts, the term discipline can also cover some of these aspects. See Filer (2009) on the challenges of defining or categorizing knowledge systems.

[2] https://www.ipbes.net/node/38259

and made subservient to dominant, often natural science, problem framings (Winkler-Schor et al., 2024, Holmes et al., 2022, Reyes-García and Benyei, 2019, Claus, 2022). Although IPBES is often claimed to stand out among global environmental science-policy interface organisations for adopting an inclusive understanding of knowledge that goes beyond science, it has struggled to ensure the equitable inclusion of diverse paradigms and knowledge systems (Díaz-Reviriego et al., 2019, Stokland et al., 2022).

In view of the critical importance of marginalised forms of knowledge for transformative change and the risk that GEAs will end up further deepening this marginalisation, scholars have argued that developing an assessment of transformative change will require a different approach than is commonly used in GEAs. Specifically, it will need to pay more attention to co-production and reflexivity (Beck and Forsyth, 2020), and to the question how IPBES can avoid serving powerful interests that are vested in the status quo (Gustafsson and Hysing, 2023). In other words, the TCA will need to address these epistemic inequities and become an exercise in epistemic justice (Fricker, 2007). There are two parts to this. The first challenge is to identify epistemic inequities and report on them as part of the assessment work on knowledge gaps. The second challenge concerns the manner and extent to which the process of the assessment has pursued epistemic justice by addressing these epistemic inequities.

In this article we, a group of assessment experts,[3] reflect on these two challenges. We do this for different reasons. First, in view of the authority attributed to GEAs, it is critical to offer transparency. Second, we aim to foster reflexivity and open dialogue about IPBES and the challenges, limitations and opportunities of GEAs. Third, our analysis aims to contribute to ongoing scientific debate about inclusion and epistemic justice in inter and transdisciplinary environmental knowledge practices more generally. We start in Section 2 by discussing what gaps and inequities have been identified and presented in the assessment. Section 3 continues with a discussion of the assessment process to examine how and to what extent the assessment has addressed epistemic inequities. By presenting this analysis, we do not wish to undermine the assessment and its conclusions. Rather, we aim to articulate recommendations that can support the ability of GEAs to tackle epistemic inequities and injustices.

2. Epistemic inequities in the assessment

Each of the chapters of the Transformative Change Assessment was tasked to identify the main knowledge gaps from the synthesis of available knowledge. These gaps are either based on collective expert judgement by the assessment experts, available literature, or specific literature searches in the catalogue OpenAlex.[4] This section presents the findings of the work on knowledge gaps and our analysis of epistemic inequities focusing on three main topics: conceptualizing and defining transformative change; power relations, dominant interests and barriers to transformative change; and transformative strategies, approaches, and visions.

2.1. Conceptualizing and defining transformative change

To gain an understanding of epistemic inequities in the literature on nature and environment related to social sciences and alternative paradigms and knowledge systems, we undertook a number of literature searches. Results point to a dominance of natural science concepts and approaches to biodiversity with only a small segment of the literature focusing on policy and governance, transformative change, or using concepts of nature or biodiversity that go beyond species and ecosystems, such as stewardship, Mother Earth, or conviviality.[5] These findings fit with broader patterns in environmental research. For example, in climate research, it has been estimated that only 0.12% of total research funding goes to the social sciences (Overland and Sovacool, 2020). Similarly, research into biodiversity decline has a significant gap in exploring links to human wellbeing (Pires et al., 2018). This confirmed that to define transformative change, the assessment, indeed, needed to venture outside the mainstream biodiversity literature.

As a second step, we aimed to develop an understanding of geographic patterns in literature. We noted a geographic imbalance in the literature that is accessible to the assessment via peer-reviewed journal papers. Moreover, this literature tends to focus on changing societies, policies and governance in the global North and draws exclusively on currently hegemonic concepts of governance and policy, and sustainability, while overlooking Indigenous Peoples', and decolonial contexts, perspectives, and knowledge systems, (Jehlička et al., 2020, Ramcilovic-Suominen et al., 2025). This imbalance was further confirmed by an analysis of six main review articles on transformative change and the articles that are cited in these six articles. The findings show that some regions, such as Africa, Eastern Europe, parts of Asia, as well as small Pacific territories and island states, do not produce any literature on the subject or are completely under the radar of these review articles.[6]

In addition to these imbalances and inequities, the assessment had the challenge of dealing with diversity and fragmentation in the available literature in how transformative change is described. For example, literature on social-ecological transformations is often separate from literature on social-technical transitions that focuses on technical solutions and specific sectors such as energy or mobility (Hackmann et al., 2014; van den Berg et al., 2022). In turn, these two are often disconnected from transdisciplinary or co-production research that aims to directly contribute to change, although this gap is being closed by a growing body of scholarship that connects social-ecological transformations, sustainability and co-production (Moser, 2024; Mehta et al., 2025; Chambers et al., 2022). We also noted a lack of connection between local or place-based studies, for example within the social-ecological systems literature, and scholarly fields such as history, political economy or sociology that are often theoretically oriented or focus on macro-level processes of change (Salomaa and Juhola, 2020). Each of these bodies of literature comes with strengths and blind spots such as limited attention to power, structural dimensions of transformative change, or context-specific practices (Whitmarsh et al., 2021; Newell et al., 2021; Penca, 2023).

A further complicating factor is that the diverse forms of knowledge that are relevant for transformative change draw on different, and sometimes incommensurable paradigms and knowledge systems. They use different conceptions of change, including those that focus on individual and behaviour change, policy or institutional change, or changes in structures and worldviews, and they also use multiple and not fully compatible definitions and conceptualizations of such terms. This means that there is no agreement in the available knowledge about

[3] The authors of the article include review editors, contributing authors, lead authors and coordinating lead authors.

[4] OpenAlex is a database with global and broad coverage of literature across disciplines, including physical and social sciences, arts and humanities, and grey literature. Assessment experts have searched this catalogue using specific search strings related to biodiversity, transformative change, and other relevant topics. Methodological details can be found in the relevant data management reports of the assessment.

[5] We found that around 15% of the literature on nature and environment (https://zenodo.org/records/14734007) relates to conservation, policy, management, or governance and around 10% refers to concepts of nature beyond natural science understandings (https://zenodo.org/records/12821726). Finally, we found that around 5% of the literature on nature and environment refers to concepts related to transformative change (https://zenodo.org/records/11657982)

[6] https://zenodo.org/records/13960959

when specific documented changes or processes can be considered transformative and why. This plurality of conceptions of transformative change proved to be an important point of tension and contestation during the development of the assessment.

The case studies database that was created for the assessment is a case in point.[7] The database pulled together evidence from a range of case studies from various sources. It included information about the types of actors involved, timeframe, and outcomes and it offers an analysis, done by specific experts in the assessment that are familiar with the case, of the transformative characteristics and potential of each case. Yet, this analysis was often done without broader discussion among assessment experts. So, whether a case was presented as exhibiting characteristics of transformative change depended heavily not only on what theories and concepts were used to understand what constitutes societal transformations and how they unfold, but also on whose and which perspectives are foregrounded in the analysis or documentation of the cases.

The database was created to meet a presumed policy demand for evidence and was designed to represent cases as discrete examples of transformative change. Although some alternatives have been discussed during the assessment process, the database ended up privileging a positivist representation of evidence, presenting cases as singular empirical phenomena rather than as phenomena whose meaning and status may be contested across different paradigms and knowledge systems. In such a database, it was not possible to recognize and reflect on the fundamental entanglement between the objects of knowledge and the processes that produce this knowledge. This positivist approach, however, stands in tension with a pluralist approach that would be inclusive of diverse paradigms and knowledge systems, including those that are not based on positivist distinctions between subject and objects of knowledge. Some assessment experts tried to raise this point and offered critical comments on the very idea of having a database of examples of transformative change as well as on its design. Drawing on alternative paradigms and knowledge systems, they emphasized the importance of recognizing pluralism, contestation, contingency, and multiplicity not only in transformative change itself (Scoones et al., 2020) but also in expert and scholarly accounts and studies of transformative change. Alternative designs could have offered space for reflexivity and transparency to account for what framings, assumptions, paradigms and knowledge systems were dominant in defining what would count as transformative (Stirling, 2019; Stokland et al., 2023) or could have adopted a pluralist approach that would include diverse, competing interpretations of specific cases. Ultimately, these options proved impossible. The database ended up presenting examples of transformative change as matters of fact that can be scientifically determined instead of encouraging deliberation among various societal actors on what constitutes transformative change and how they can move towards it (Stokland et al., 2026).

The example of the database shows that within the assessment, open reflection on the impossibility of disentangling the reality of transformations from the paradigms and knowledge systems that shape how we know and report on that reality in research and in practice was not possible. This effectively meant that pluralist approaches that argue for the importance of such reflection in order to recognize and be inclusive of different and incommensurable paradigms and knowledge systems, struggled to gain recognition and could not be accommodated. In other words, the assessment not only faced challenges in representing the plurality of paradigms and knowledge systems related to transformative change but also failed to incorporate pluralism as a paradigm and knowledge system itself.

In the end, the assessment has pieced together different themes and concepts to develop a definition of transformative change that includes attention to the common underlying root causes of intersecting social and environmental crises, the different theoretical approaches that explain how transformations takes place, the cultural, economic, and political structures, paradigms, and interests that support and justify the destruction of nature and obstruct transformation, and the importance of considerations of justice and equity (Gurung et al., 2024). This definition recognizes that perfect examples of transformative change that align with each of these aspects do not exist, that transformation is a process for which multiple pathways and entry points are possible, and that transformation is inevitably unpredictable and non-linear and requires constant reflection and adaptation.

2.2. Power relations, dominant interests, and barriers of transformative change

Several studies demonstrate the role of specific sectors and actors in biodiversity loss, including the public sector, the financial sector, energy, agriculture, mining, infrastructure, and the textile industry (Reyes-García et al., 2025). Yet, gaps were identified with respect to detailed information about the biodiversity impacts of specific companies and activities within these sectors and the specific biodiversity impacts of government subsidies and other financial instruments. There is agreement in the available knowledge that these sectors and actors benefit from the current system, hold considerable power, and form a barrier to transformative change, but studies that demonstrate how exactly these actors and sectors leverage their power and resources to obstruct efforts and actions for sustainability are limited. There were significant gaps in knowledge about the strategies and extent of lobbying, spreading of misinformation, greenwashing, and their impacts on transformative change. While research on these topics does exist (Forchtner and Lubarda, 2023; Hall et al., 2024; Roberts et al., 2025; Stoddard et al., 2021) there is a lack of studies that explicitly link these topics to biodiversity loss.

Knowledge and value systems are considered as deep leverage points (Abson et al., 2017), which means that addressing these has high potential for catalysing transformative change. Yet, there is a lack of knowledge about how dominant and powerful forms of knowledge and value systems act as powerful obstacles for transformative change, for example by normalizing and justifying existing power structures or by promoting siloed actions that address symptoms instead of systems. While there is growing attention to the role of science in historical and ongoing processes of colonialism, capitalism, exploitation, and oppression (Quijano, 2007; Liboiron, 2021; Sultana, 2022), this literature remains in the margins and is poorly recognized in biodiversity research and practice.

The assessment concludes that there is convergence in the available knowledge about the underlying causes of biodiversity loss – defined in the assessment as: dominant paradigms and knowledge systems that separate humans from nature and that justify domination and exploitation; the concentration of power and wealth; and the prioritization of short termism and individual material gains (Gurung et al., 2024). Yet, we noted two critical issues. First, much of the literature that uses terms like underlying causes or indirect drivers is in fact limited to a discussion of direct drivers of biodiversity loss, notably land use change.[8] This shows that the synthesis of literature requires careful engagement with the terms being used in the literature without assuming consistency in how such terms are being interpreted and applied. Second, literature that does discuss underlying causes often does not detail specific biodiversity implications and rather may focus on issues like climate change, pollution, and social inequities and injustices. This meant that important literature focused on transformation, but from other fields or

[7] https://zenodo.org/records/17366884

[8] A search string in Open Alex to find results that related to underlying causes initially returned 1600 results. However, when assessment experts screened for sources that really addressed underlying causes, only 61 sources remained (https://zenodo.org/records/11657982).

related to other topics, was difficult to identify and include.

Our analysis shows that studies that address power, obstruction, and the underlying causes of biodiversity loss - issues that are critically important for transformative change - are underrepresented in the mainstream scientific literature. This mirrors other analyses that have similarly pointed to the marginal position of critical perspectives that challenge dominant interests, and uneven power relations in environmental social sciences (Arora-Jonsson and Wahlström, 2023, Rayner, 2012, Montana et al., 2025, Theis and Light, 2024). This situation constrains the ability of researchers, policy makers, businesses and societal actors to understand, frame, and act upon the problem of biodiversity loss in its full scope, including the role of dominant power relations, paradigms, knowledge systems, values and worldviews as underlying causes of the polycrisis.

2.3. Transformative strategies, approaches, and visions

In its work to assess options for action for biodiversity, the IPBES Global Assessment noted a general gap in knowledge about the biodiversity impacts of existing policies and measures (IPBES, 2019). This gap is even more pronounced when it comes to the transformative impacts and potential of actions and strategies in addressing the underlying causes of biodiversity loss towards a just and sustainable world. For example, much of the research on transformative actions and strategies does not report on which underlying causes or barriers they address.

The potential of alternative options and strategies that can catalyse transformative change is understudied and underreported. One reason is that much of the focus of research, policy, and practice is on actions and strategies that exist, and these are predominantly those that do not challenge current political economic structures and dominant interests - hence the need for transformative change. For example, there is a lack of knowledge about the transformative potential of the use of legal innovations such as rights of nature and the prohibition of ecocide in international law (but see Banwell et al., 2025). There is also a significant knowledge gap in strategies that can facilitate the termination and abandonment of practices, policies, and regulations that are harmful for humans and nature and block transformation, including studies that draw on notions of unmaking, de- or post-growth, hospicing, or abolition (Feola et al., 2021; Kallis et al., 2025; Machado de Oliveira, 2021; Miyake 2024). Indeed, many of these concepts exist as ways to push back against or refuse and escape from dominant structures, but due to prevailing power inequalities, they are currently largely being enacted as pockets of resistance rather than broad scale changes.

We also noted knowledge gaps related to the role of specific actors.[9] For example, while there is information on the actions taken by social movements against threats to the environment, their transformative potential is less well documented. Moreover, the roles of these actors were framed in inequitable ways. For example, Indigenous Peoples and local communities were often cast in passive ways, as recipients rather than leaders or agents of transformative change.

There is a lack of knowledge about approaches that can guide processes of transformation and support deep shifts on the level of paradigms, knowledge systems, worldviews and values. These can include Indigenous Peoples' approaches such as Two-Eyed Seeing and Indigenous Storywork (Bartlett et al., 2012), transformative pedagogies (Lotz-Sisitka et al., 2015), the role of arts-based, collaborative and narrative methods (Montuori, 2012; Pereira et al., 2023), and approaches that centre on justice, accountability, and collective action. While there is convergence in the available knowledge that such methods and approaches are vital, they remain underrepresented in the literature.

Gaps were also identified in future visions. Specifically, future visions tend to reflect a simplistic and narrow understanding of justice and sustainability (Bazile and Karuri-Sebina, 2025). As such, there is a risk that envisioned futures may be romanticized and ignore the potential burdens and losses involved in transformations (Blythe et al., 2018). Moreover, while it is widely recognized that transformations require the development of visions that offer alternative futures to the present, many future visions do not radically depart from, and even to a significant extent reproduce the present (Hajer and Oomen, 2025) and risk locking us further into unsustainable and colonial systems and structures (Krishnan, 2022). This is the case for most quantitative modelling and scenario methodologies that extrapolate from current trends and existing policies, but also many qualitative approaches tend to limit the exploration of the future to what is deemed plausible or desirable according to dominant paradigms and knowledge systems (Beck and Oomen, 2021). While there is a surge in effort to carve out space for pluralist, critical, relational, and Indigenous paradigms and knowledge systems in utopian and futures scholarship (Levitas, 2013; Cooper, 2013; Monticelli, 2024; Serafini, 2022; Terry et al., 2024; Chambers, 2025; Ressiore et al., 2024; Harnesk and Isgren, 2022; Hedrén and Linnér, 2009), much of the current work reflects the very biases that transformative change seeks to overcome.

All in all, our analysis shows significant epistemic inequities with a majority of strategies, approaches, and visions focusing on mainstream policies, dominant actors, and visions and aspirations that reproduce the current status quo.

3. Epistemic justice and the assessment process

The previous section points to two persistent and interrelated patterns in the knowledge available for the assessment: 1) pluralist, critical, relational, and Indigenous paradigms and knowledge systems are underrepresented compared to positivist paradigms and knowledge systems; and 2) knowledge about aspects that are specific for transformation, such as knowledge about the underlying causes of biodiversity loss and how to tackle them, knowledge that challenges dominant interests and power relations, and knowledge that supports and develops transformative alternatives, is underrepresented compared to knowledge that supports dominant interests and aligns with their priorities and agendas. Where this literature exists, it often does not mention biodiversity, and this made it difficult to incorporate due to the explicit biodiversity focus in the assessment.

This analysis of epistemic inequities means that it is critical that the assessment be organised to overcome inequities and pursue epistemic justice. This section reflects on how and to what extent the assessment process has been able to achieve this and to what extent it has reproduced or even amplified existing epistemic inequities. We discuss the following topics: the representation of diverse forms of expertise in the assessment, co-production, and the roles of consensus and hierarchy.

3.1. The representation of diverse forms of expertise in the assessment team

The focus of the assessment on transformative change implied that the expert team needed to include a sufficient number of social scientists representing diverse paradigms and knowledge systems. The assessment has been presented as including a comparatively high number of social scientists compared to other GEAs. But this did not mean that there was always a positive attitude towards diverse traditions in social sciences, and their value has been openly and publicly questioned during the process. It also does not guarantee sufficient diversity in paradigms and knowledge systems. Specifically, we noted a high representation of a social-ecological systems paradigm, including associated notions of common pool resources, natural resource management, ecosystem

[9] Only 12% of the literature about actors driving transformative change referred to 'local communities' and 2.1% mentioned Indigenous Peoples, while references to 'business' or 'the scientific community were much more frequent at approximately 30% (https://zenodo.org/records/13862424; Walter et al., 2025; Reyes García et al., 2026a; Reyes García et al., 2026b)

services, and complex adaptive systems, in the assessment team and in the leadership of the assessment. Alternative paradigms and knowledge systems were less well represented in the assessment team.

To fill gaps in expertise, IPBES assessments allow for the invitation of contributing authors. Assessment experts can request contributing authors to submit texts about specific topics and subsequently, they can use these to complement the assessment chapters. However, it proved to be challenging to attract scholars from smaller fields of scholarship. One reason is that increasing requests to represent their knowledge without addressing marginalisation results in overburdening, something that has often been described in equity, diversity and inclusion initiatives (Ahmed, 2012).

All in all, it can be concluded that despite efforts to enhance diversity, the assessment team reflects a dominance of social-ecological systems thinking and an underrepresentation of alternative paradigms and knowledge systems, including pluralist, critical, relational, and Indigenous paradigms and knowledge systems. These patterns in authorship reflect wider structural factors. The social-ecological systems paradigm has a long tradition in GEAs (Filer, 2009). This paradigm has been popularized in the Millenium Assessment and continues to serve as the framework of choice in GEAs that aim to integrate knowledge of natural systems, social systems, and the diverse interactions between them, including in IPBES (Borie and Hulme, 2015). This suggests the consolidation of a community of experts that are familiar with these types of assessment processes and are therefore more likely to seek nomination, get selected, and be placed in leadership positions.

3.2. Co-production

It is increasingly recognized that participatory approaches to knowledge production are essential for the uptake and impact of knowledge. These approaches are commonly referred to as co-production - although analysts sometimes differentiate between consulting with diverse stakeholders versus a deeper acknowledgement that researchers' own tacit values and backgrounds also shape the objectives of research and who is included (Chambers et al., 2022). As was also concluded in an earlier review of IPBES, a co-production approach would be beneficial for the credibility, relevance, and impact of assessments (Stevance et al., 2020). Adopting such a co-production approach is especially relevant for an assessment that aims to support transformative change (Beck and Forsyth, 2020; Gustafsson and Hysing, 2023) because it can be a vehicle for addressing epistemic inequities particularly in relation to forms of knowledge that are marginalised, not written down, or not formalised.

Specifically for Indigenous and local knowledge, IPBES has pioneered a dedicated approach (Hill et al., 2020; McElwee et al., 2020). Key features of this approach include the work of a dedicated taskforce that supports assessment processes and the organisation of dialogues with representatives of Indigenous and local knowledge systems. In the context of the Transformative Change assessment, three dialogues were organised to discuss the assessment and its findings and the results of these dialogues served as input for the assessment.[10] These efforts produced mixed results. While the reports that were produced about the dialogues were seen as helpful, and they did inform the assessment via the review processes, there were challenges. For example, contributors to the assessment proposed that the process failed to distinguish sufficiently between land-management practices that enhanced biodiversity (such as tilling or forest restoration techniques) from underlying Indigenous cosmologies, which could mean that IPBES tended only to include Indigenous people when they were engaged in traditional livelihoods. Did this homogenize the categories of Indigenous and local knowledge? Second, contributors pointed to the challenges of including tacit and oral forms of knowledge in written form. The overriding concerns were that these diverse paradigms and knowledge systems might only be represented when co-opted into dominant frameworks (see also Filer, 2009).

There are no comparable processes within IPBES to engage other knowledge holders, such as non-Indigenous smallholder farmers, practitioners, artists, and social or youth movements. While these groups hold important knowledge of alternative ways of knowing, valuing, and living with biodiversity, they could engage with the transformative change assessment only through the stakeholder dialogues and the external review process. Following the recommendations from the review of IPBES (Stevance et al., 2020), a group of assessment experts took the initiative to explore possibilities, including structured dialogues and co-learning cycles, to facilitate broader and deeper interactions with these knowledge holders from an early stage, and in so doing, stimulate public dialogue, coproduce the assessment, and enhance its legitimacy and impact. However, there were challenges in implementing such approaches and the initiatives were ultimately strongly discouraged because they were judged to be incompatible with established IPBES procedures.

Finally, aspects of co-production can be identified in the negotiation of the summary for policy makers. However, access to this process is unequal. Currently, governments have much stronger rights than other stakeholders. Moreover, some governments have a much stronger position than others to wield their influence in various stages of the assessment, including its scoping, reviewing, and negotiation. This is an important issue in the context of transformative change since this situation risks reproducing dominant interests while marginalising other governments and stakeholders that aim to challenge dominant power relations and develop alternatives.

Thus, the Transformative Change Assessment illustrates that it remains challenging to centre diverse paradigms and knowledge systems, including those from Indigenous and local knowledge and from societal stakeholders.

3.3. Hierarchy and consensus

The processes of producing the assessment and the summary for policy makers are structured in a hierarchical way. For example, contributing authors contribute to the assessment by submitting texts, but they have no direct access to or control over the way in which these inputs are used. A second example is that while lead authors and coordinating lead authors together write the chapters of the assessment, only the coordinating lead authors, together with the co-chairs of the assessment, are authors of the summary for policy makers that is derived from the assessment. While the latter is, as far as we know, not a formal rule of IPBES, it is a strong informal rule and practice and in the Transformative Change assessment it was included in the scoping document and strictly implemented in the assessment process.

While these hierarchical lines are often seen as contributing to coordination and efficiency, it should be understood that they not only define divisions of labour but also distribute access to information and power in ways that can privilege certain paradigms over others. The hierarchical process in the assessment raises its own concern of whether it is unethical to produce a summary of work without inviting all authors of the work that is being summarized as authors of this summary. In addition, there is the risk that it leads to certain findings from the assessment chapter being excluded from the summary for policy makers, or framed in specific ways to align with dominant paradigms and framings.

These dynamics are also related the role of consensus in the assessment and the lack of space to foreground pluralism and contestation. One example that was discussed earlier is the process of developing the case study database. Despite tensions and various attempts to properly discuss these, the assessment includes a database that presents cases as singular examples of transformative change. Another example related to

[10] The reports of these dialogues can be found here: https://www.ipbes.net/ilk-dialogue-reports

the discussions and contestations about Indigenous and local knowledge where the assessment also ended up privileging specific interpretations while excluding others. The importance of consensus was also clear in how assessment experts have been discouraged from including an extensive discussion in the assessment of methodological limitations, including epistemic inequities and injustices, because this was seen as potentially undermining the assessment.

The discussion in this section shows that the assessment has struggled to include knowledge from pluralist, critical, relational, and Indigenous paradigms and knowledge systems in the assessment and in the summary for policy makers. Especially knowledge that would question the very possibility of singular consensus-based definitions and descriptions of important phenomena related to transformative change - and the singularity of phenomena themselves – proved very challenging to accommodate.

4. Conclusion

Our analysis first demonstrated that the available knowledge on which the assessment is based is characterized by stark inequities between dominant natural science and positivist paradigms and knowledge systems, and a general and persistent marginalization of knowledge derived from alternative, pluralist, critical, relational, and Indigenous, paradigms and knowledge systems. Second, we discussed the extent to which the assessment process has addressed these epistemic inequities and pursued epistemic justice. In terms of representation of diverse paradigms and knowledge systems, the assessment team partly mirrored the epistemic inequities in the available knowledge. Efforts to enhance diversity through the invitation of contributing authors or enhance legitimacy and relevance by means of co-production have gone some way to address these inequities, especially for the inclusion of Indigenous and local knowledge. However, a prevalence of a positivist systems paradigm, combined with structural features of the assessment process have resulted in the marginalisation of alternative paradigms and knowledge systems and have restricted possibilities for reflexivity and pluralism.

All in all, there are important parallels between the power relations, patterns of marginalisation, and the reinforcement of dominant paradigms and knowledge systems in the knowledge base of the assessment and in the assessment process itself. This is ironic in view of one of the key messages of the Transformative Change Assessment itself. The assessment notes that one of the underlying causes of biodiversity loss is a dominant paradigm or worldview that is based on the distinction between people and nature and between subjects and objects. Yet, as our analysis has demonstrated, this same paradigm is also dominant in biodiversity research and underlies most of the knowledge that has been assessed, and it was dominant in the assessment and shaped its framework and processes. Further, while the IPBES Global Assessment (Visseren-Hamakers et al., 2021) concluded that processes of co-production are essential for transformative change, the Transformative Change Assessment was limited in adopting such an approach, it did not engage a diversity of actors, and it ended up privileging existing power relations and interests.[11] In other words, the assessment has not adopted a transformative approach, and it has itself, perhaps unwittingly, promoted a key underlying cause of biodiversity loss.

The issues raised here go beyond this specific assessment and point to the common structural factors that underlie not only the epistemic inequities in the available knowledge used in the assessment but also the limitations in overcoming them in the assessment process and achieving epistemic justice. The wider environmental knowledge landscape that GEAs are situated in and form part of, has been fundamentally shaped by natural science and positivist paradigms that determine what knowledge is and is not produced, what knowledge is seen as relevant and credible, and how knowledge is produced, assessed and synthesized. Particularly relevant here is the belief – a belief that can be identified not only in GEAs but also in many other interdisciplinary and transdisciplinary research projects - in the possibility and desirability of the integration of diverse knowledges, and the creation of a singular narrative that presents objective scientific consensus (Stokland et al., 2026). Such logics of consensus and integration are known to result in the reduction and co-optation of diversity and the silencing or dismissal of paradigms that challenge dominant positivist paradigms and associated logics (Deutsch et al., 2023; Hulme, 2011; Tadaki et al., 2015; Montana et al., 2025) and they stand in tension with pluralism and the acknowledgement of difference and incommensurability (Turnhout and Lynch, 2025; Klenk and Meehan, 2015).

Our analysis of epistemic inequities and injustices point to the persistent production of ignorance about transformative change (Rayner, 2012; McGoey, 2019). This situating of unknowing transformative change is structural and self-perpetuating in the sense that it results in the delegitimization not just of knowledge that is critical for transformative change, but also of options to pursue transformative change. Changing these patterns requires transforming the systems, institutions, norms and values that shape science and science policy relations (Maas et al., 2026). Creating an equitable knowledge base is a critical priority that will require fundamental changes in research priorities, funding, and evaluation. Biodiversity focused research funding will need to take steps to enhance the representation of alternative paradigms and knowledge systems, for example by setting quotas for participation in inter and transdisciplinary projects and by prioritizing research projects led by alternative, pluralist, critical, relational, and Indigenous paradigms and knowledge systems. More generally, inter- and transdisciplinary collaborations in research projects as well as in GEAs will need to become more attentive to power inequalities and knowledge hierarchies and prevent the marginalisation, silencing, or coopting of alternative paradigms and knowledge systems.

Specifically for IPBES, the question is what would be needed to transform IPBES into a “transformative agent” (Gustafsson and Hysing, 2023). If we would follow the analysis that the assessment itself presents, IPBES would need to address the common underlying causes of epistemic inequities and injustices by overcoming the current concentration of power by dominant paradigms and knowledge systems. What this would imply is that it undertakes further efforts to pursue justice and pluralism by actively dismantling dominant paradigms and knowledge systems, increasing space for reflexivity and pluralism - including plural understandings of biodiversity, knowledge, and transformative change, and fostering the equitable and just participation of diverse societal actors.

Taking steps in this direction would require changes to several informal and formal rules and procedures within IPBES. For one, it will need to rethink the principle of consensus in the negotiation of assessments and reduce the concentration of power. This is also supported by the failed negotiations of the summary for policy makers of the 7th Global Environmental Outlook, another major international environmental report. The negotiations were characterized by efforts by some governments to weaken statements on politically sensitive topics to the extent that scientific integrity was at risk (Alexander et al., 2025). Since governments can wield their power to influence assessment findings at various stages in the assessment process, protecting scientific integrity will require a rethinking of assessment processes as a whole. IPBES can also take steps to expand their stakeholder engagement strategy (Stevance et al., 2020) and grant stronger rights to diverse societal stakeholders in negotiating the scoping document and the summary for policy makers. The role of the Multidisciplinary Expert Panel (MEP) and external reviews must not be underestimated in this process.

It should also reconsider the role of hierarchy and consensus in the assessment process to ensure fair authorship practices and improve

[11] Mervis and Pérez Ortega, (2024) offer a comparable example of a study about co-production that did not adopt a co-production approach, resulting in controversy and the termination of the study.

inclusion and epistemic justice. While often authority is attributed to global science policy platforms speaking with one voice, the actual contribution of consensus to impact and uptake is questionable and its role in marginalising paradigms and knowledge systems is difficult to justify. A pluralist approach that explicitly recognizes difference and incommensurability can not only contribute to the transparency, inclusiveness, and legitimacy of assessments but also enhance their impact by empowering a diversity of stakeholders (Maas et al., 2021).

More generally, assessment processes will benefit from more space for reflexivity and care (Borie et al., 2020; Ressiore et al., 2025). Interdisciplinary and transdisciplinary processes demand considerable time investment and dialogue (Caniglia et al., 2023) and the inclusion of alternative paradigms and knowledge systems will require dedicated effort and training (Deutsch et al., 2023; Montana et al., 2025). Making progress in these issues will have implications for the organisation, timing, and pace of assessment processes. While improving the contribution of knowledge practices to transformative change requires changes in the wider research and assessment landscape, we suggest that IPBES use its prominent position to demonstrate leadership and take significant steps towards transforming environmental knowledge, in part through becoming a transformative agent itself.

CRediT authorship contribution statement

Chambers Josephine M.: Writing – review & editing, Formal analysis. **Linner Björn-Ola:** Writing – review & editing, Formal analysis. **Julia Leventon:** Writing – review & editing, Formal analysis. **Valerie Nelson:** Writing – review & editing, Formal analysis. **Lyla Mehta:** Writing – review & editing, Formal analysis. **Victoria Reyes-García:** Writing – review & editing, Formal analysis. **Kristina Raab:** Writing – review & editing, Formal analysis. **Stokland Håkon B:** Writing – review & editing, Formal analysis. **Peter Bridgewater:** Writing – review & editing, Formal analysis. **Catherine Sabinot:** Writing – review & editing, Formal analysis. **Esther Turnhout:** Writing – review & editing, Writing – original draft, Formal analysis, Conceptualization. **Qingxu Huang:** Formal analysis. **Tim Forsyth:** Writing – review & editing, Formal analysis.

Declaration of Competing Interest

The authors declare no conflict of interest

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Data Availability

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

References

Abson, D.J., Fischer, J., Leventon, J., Newig, J., Schomerus, T., Vilsmaier, U., von Wehrden, H., Abernethy, P., Ives, C.D., Jager, N.W., Lang, D.J., 2017. Leverage points for sustainability transformation. Ambio 46 (1), 30–39. https://doi.org/10.1007/s13280-016-0800-y.

Ahmed, S., 2012. On Being Included: Racism and Diversity in Institutional Life. Duke University Press. https://doi.org/10.1215/9780822395324.

Alexander, P., Beevers, L., Broadstock, D., Daioglou, V., Davies, T.J., Gutiérrez-Espeleta, E.E., Ley, D., Lucas, P., Rueff, H., Schröder, P., Seadon, J., Taylor, G., Turcu, C., Turnheim, B., Watson, R.T., 2025. Protecting science in multilateral environmental assessments. Nat. Sustain. https://doi.org/10.1038/s41893-025-01727-1.

Arora-Jonsson, S., Wahlström, N., 2023. Unraveling the production of ignorance in climate policymaking: The imperative of a decolonial feminist intervention for transformation. Environ. Sci. & Policy 149, 103564. https://doi.org/10.1016/j.envsci.2023.103564.

Banwell, S., Nelson, V., Dehbi, F., 2025. Achieving sustainability transformations for multi-species justice: Assessing the potential of diverse legal pathways and societal struggles. Sustain. Sci. 20 (3), 1017–1035. https://doi.org/10.1007/s11625-025-01627-5.

Bartlett, C., Marshall, M., Marshall, A., 2012. Two-Eyed Seeing and other lessons learned within a co-learning journey of bringing together Indigenous and mainstream knowledges and ways of knowing. J. Environ. Stud. Sci. 2 (4), 331–340. https://doi.org/10.1007/s13412-012-0086-8.

Bazile, S., Karuri-Sebina, G., 2025. The wilds beyond 2×2 futures: An enquiry into decolonising foresight. In: Crawford, M.M., Wright, G. (Eds.), Improving and Enhancing Scenario Planning. Edward Elgar Publishing, pp. 119–142. https://doi.org/10.4337/9781035310586.00013.

Beck, S., Forsyth, T., 2020. Who gets to imagine transformative change? Participation and representation in biodiversity assessments. Environ. Conserv. 47 (4), 220–223. https://doi.org/10.1017/S0376892920000272.

Beck, S., Oomen, J., 2021. Imagining the corridor of climate mitigation – What is at stake in IPCC's politics of anticipation? Environ. Sci. & Policy 123, 169–178. https://doi.org/10.1016/j.envsci.2021.05.011.

Bennett, E.M., Reid, W., Carpenter, S.R., Dietz, T., Peterson, G.D., Ash, N., Beard, D., Beck, S., Biggs, R., Castree, N., Ehrmann, j, Forsyth, T., Garcia, K., Harvey, B., Harmáčková, Z., Kumar, P., Lahsen, M., Lee, M., Miller, C.A., Norgaard, R.B., Pereira, L., Prodani, K., Ranganathan, J., Raudsepp-Hearne, C., Schultz, L., Turnhout, E., Vogel, C., Zurek, M., 2026. The Future of Global Environmental Assessments: 20 years after the Millennium Ecosystem Assessment. Curr. Opin. Environ. Sustain. https://doi.org/10.1016/j.cosust.2026.101618.

Blythe, J., Silver, J., Evans, L., Armitage, D., Bennett, N.J., Moore, M., Morrison, T.H., Brown, K., 2018. The Dark Side of Transformation: Latent Risks in Contemporary Sustainability Discourse. Antipode 50 (5), 1206–1223. https://doi.org/10.1111/anti.12405.

Borie, M., Hulme, M., 2015. Framing global biodiversity: IPBES between Mother Earth and ecosystem services. Environ. Sci. & Policy 54, 487–496. https://doi.org/10.1016/j.envsci.2015.05.009.

Borie, M., Gustafsson, K.M., Obermeister, N., Turnhout, E., Bridgewater, P., 2020. Institutionalising reflexivity? Transformative learning and the Intergovernmental science-policy Platform on Biodiversity and Ecosystem Services (IPBES). Environ. Sci. & Policy 110, 71–76. https://doi.org/10.1016/j.envsci.2020.05.005.

Caniglia, G., Luederitz, C., von Wirth, T., Fazey, I., Martín-López, B., Hondrila, K., König, A., von Wehrden, H., Schäpke, N.A., Laubichler, M.D., Lang, D.J., 2021. A pluralistic and integrated approach to action-oriented knowledge for sustainability. Nat. Sustain. 4 (2), 93–100. https://doi.org/10.1038/s41893-020-00616-z.

Caniglia, G., Freeth, R., Luederitz, C., Leventon, J., West, S.P., John, B., Peukert, D., Lang, D.J., von Wehrden, H., Martín-López, B., Fazey, I., Russo, F., von Wirth, T., Schlüter, M., Vogel, C., 2023. Practical wisdom and virtue ethics for knowledge co-production in sustainability science. Nat. Sustain. 6 (5), 493–501. https://doi.org/10.1038/s41893-022-01040-1.

Chambers, J. (Ed.), 2025. Utopia*Art*Politics: Experimenting with artistic practices in radical imagination and politics Urban Futures Studio, Community Portal @ BAK, basis voor actuele kunst. Stichting Moira, Utrecht, Netherlands. https://doi.org/10.5281/ZENODO.14930484.

Chambers, J.M., Wyborn, C., Klenk, N.L., Ryan, M., Serban, A., Bennett, N.J., Brennan, R., Charli-Joseph, L., Fernández-Giménez, M.E., Galvin, K.A., Goldstein, B. E., Haller, T., Hill, R., Munera, C., Nel, J.L., Österblom, H., Reid, R.S., Riechers, M., Spierenburg, M., Rondeau, R., 2022. Co-productive agility and four collaborative pathways to sustainability transformations. Glob. Environ. Change 72, 102422. https://doi.org/10.1016/j.gloenvcha.2021.102422.

Clarke, V., Braun, V., Adams, J., Callaghan, J.E.M., LaMarre, A., Semlyen, J., 2025. Being really confidently wrong": Qualitative researchers' experiences of methodologically incongruent peer review feedback. Qual. Psychol. 12 (1), 7–24. https://doi.org/10.1037/qup0000322.

Claus, C.A., 2022. Conservation Social Scientists in Transnational Institutions: Negotiating Hierarchies of Expertise. Conserv. Soc. 20 (3). https://doi.org/10.4103/cs.cs_23_21.

Cooper, D., 2013. Everyday Utopias: The Conceptual Life of Promising Spaces. Duke University Press. https://doi.org/10.1215/9780822377153.

Díaz-Reviriego, I., Turnhout, E., Beck, S., 2019. Participation and inclusiveness in the Intergovernmental Science–Policy Platform on Biodiversity and Ecosystem Services. Nat. Sustain. 2 (6), 457–464. https://doi.org/10.1038/s41893-019-0290-6.

Deutsch, S., Keller, R., Krug, C.B., Michel, A.H., 2023. Transdisciplinary transformative change: An analysis of some best practices and barriers, and the potential of critical social science in getting us there. Biodivers. Conserv. 32 (11), 3569–3594. https://doi.org/10.1007/s10531-023-02576-0.

Fazey, I., Schäpke, N., Caniglia, G., Hodgson, A., Kendrick, I., Lyon, C., Page, G., Patterson, J., Riedy, C., Strasser, T., Verveen, S., Adams, D., Goldstein, B., Klaes, M., Leicester, G., Linyard, A., McCurdy, A., Ryan, P., Sharpe, B., Young, H.R., 2020. Transforming knowledge systems for life on Earth: Visions of future systems and how to get there. Energy Res. & Social. Sci. 70, 101724. https://doi.org/10.1016/j.erss.2020.101724.

Feola, G., Vincent, O., Moore, D., 2021. Un)making in sustainability transformation beyond capitalism. Glob. Environ. Change 69, 102290. https://doi.org/10.1016/j.gloenvcha.2021.102290.

Filer, C., 2009. A bridge too far: The knowledge problem in the Millenium Assessment (In). In: Carrier, J., West, P. (Eds.), Virtualism, Governance and Practice: Vision and

Execution in Environmental Conservation. Berghahn Books, New York, pp. 84–111. https://doi.org/10.3167/9781845456191 (In).
Forchtner, B., Lubarda, B., 2023. Scepticisms and beyond? A comprehensive portrait of climate change communication by the far right in the European Parliament. Environ. Polit. 32 (1), 43–68. https://doi.org/10.1080/09644016.2022.2048556.
Frederiksen, J., T., Poulsen, S.M., 2025. Gatekeeping Science: – How Methodological Critiques Police Feminist Research. Kvind. K. øN. & Forsk. 37 (2), 7. https://doi.org/10.7146/kkf.v37i2.141328.
Frickel, S., Gibbon, S., Howard, J., Kempner, J., Ottinger, G., Hess, D.J., 2010. Undone Science: Charting Social Movement and Civil Society Challenges to Research Agenda Setting. Sci. Technol. & Human. Values 35 (4), 444–473. https://doi.org/10.1177/0162243909345836.
Fricker, M., 2007. Epistemic Injustice: Power and the Ethics of Knowing. Oxford University Press. https://doi.org/10.1093/acprof:oso/9780198237907.001.0001.
Gebara, M.F., Ramcilovic-Suominen, S., Schmidlehner, M.F., 2023. Indigenous Knowledge in the Amazon's Bioeconomy: Unveiling Bioepistemicide through the case of Kambo Medicine. For. Policy Econ. 154, 103012. https://doi.org/10.1016/j.forpol.2023.103012.
Gurung, J., Leventon, J., Wickson, F., Dabezies, J., Olemako, T., Penca, J., Rajvanshi, A., Remans, R., Turnhout, E., Yoshida, Y., Kahrić, A., Naggea, J., Bridgewater, P., Reyers, B., Renaud, A., 2024. Transformative change and a sustainable world. Chapter 1 of the Thematic Assessment Report on the Underlying Causes of Biodiversity Loss and the Determinants of Transformative Change and Options for Achieving the 2050 Vision for Biodiversity. Intergovernmental Platform for Biodiversity and Ecosystem Services (IPBES). https://doi.org/10.5281/zenodo.11382238.
Gustafsson, K.M., Hysing, E., 2023. IPBES as a transformative agent: Opportunities and risks. Environ. Conserv. 50 (1), 7–11. https://doi.org/10.1017/S0376892922000467.
Hackmann, H., Moser, S.C., St. Clair, A.L., 2014. The social heart of global environmental change. Nat. Clim. Change 4 (8), 653–655. https://doi.org/10.1038/nclimate2320.
Hajer, M.A., Oomen, J., 2025. Captured Futures: Rethinking the Drama of Environmental Politics. Oxford University Press. https://doi.org/10.1093/9780198955382.001.0001.
Hall, G., Culhane, T., Roberts, J.T., 2024. Climate coalitions and anti-coalitions: Lobbying across state legislatures in the United States. Energy Res. & Social. Sci. 113, 103562. https://doi.org/10.1016/j.erss.2024.103562.
Harnesk, D., Isgren, E., 2022. Sustainability as a Real Utopia – Heuristics for transformative sustainability research. Environ. Plan. E Nat. Space 5 (3), 1678–1695. https://doi.org/10.1177/25148486211018570.
Hedrén, J., Linnér, B.-O., 2009. Utopian thought and the politics of sustainable development. Futures 41 (4), 210–219. https://doi.org/10.1016/j.futures.2008.09.004.
Hill, R., Adem, Ç., Alangui, W.V., Molnár, Z., Aumeeruddy-Thomas, Y., Bridgewater, P., Tengö, M., Thaman, R., Adou Yao, C.Y., Berkes, F., Carino, J., Carneiro da Cunha, M., Diaw, M.C., Díaz, S., Figueroa, V.E., Fisher, J., Hardison, P., Ichikawa, K., Kariuki, P., Xue, D., 2020. Working with Indigenous, local and scientific knowledge in assessments of nature and nature's linkages with people. Indig. Concept. 'Sustain.' 43, 8–20. https://doi.org/10.1016/j.cosust.2019.12.006.
Holmes, G., Carruthers-Jones, J., Huggan, G., de Smalen, E.R., Ritson, K., Šimková, P., 2022. Mainstreaming the humanities in conservation. Conserv. Biol. 36 (3), e13824. https://doi.org/10.1111/cobi.13824.
Horcea-Milcu, A.-I., Dorresteijn, I., Leventon, J., Stojanovic, M., Lam, D.P.M., Lang, D.J., Moriggi, A., Raymond, C.M., Stålhammar, S., Weiser, A., Zimmermann, S., 2024. Transformative research for sustainability: Characteristics, tensions, and moving forward. Glob. Sustain. 7, e14. https://doi.org/10.1017/sus.2024.12.
Hulme, M., 2011. Meet the humanities. Nat. Clim. Change 1 (4), 177–179. https://doi.org/10.1038/nclimate1150.
Hulme, M., 2018. Gaps" in Climate Change Knowledge. Environ. Humanit. 10 (1), 330–337. https://doi.org/10.1215/22011919-4385599.
Hunter, M., 2002. Rethinking epistemology, methodology, and racism: Or, is White sociology really dead? Race Soc. 5 (2), 119–138. https://doi.org/10.1016/j.racsoc.2004.01.002.
IPBES, 2019. Summary for policymakers of the global assessment on biodiversity and ecosystem services. Intergovernmental Platform on Biodiversity and Ecosystem Services (IPBES). https://doi.org/10.5281/zenodo.3553579.
Jehlička, P., Grīviņš, M., Visser, O., Balázs, B., 2020. Thinking food like an East European: A critical reflection on the framing of food systems. J. Rural. Stud. 76, 286–295. https://doi.org/10.1016/j.jrurstud.2020.04.015.
Kallis, G., Hickel, J., O'Neill, D.W., Jackson, T., Victor, P.A., Raworth, K., Schor, J.B., Steinberger, J.K., Ürge-Vorsatz, D., 2025. Post-growth: The science of wellbeing within planetary boundaries. Lancet Planet. Health 9 (1), e62–e78. https://doi.org/10.1016/S2542-5196(24)00310-3.
Klenk, N., Meehan, K., 2015. Climate change and transdisciplinary science: Problematizing the integration imperative. Environ. Sci. & Policy 54, 160–167. https://doi.org/10.1016/j.envsci.2015.05.017.
Krishnan, A., 2022. Unsettling the Coloniality of Foresight. In: Engle, J., Agyeman, J., Chung-Tiam-Fook, T. (Eds.), Sacred Civics. Routledge, pp. 93–106. https://doi.org/10.4324/9781003199816-10.
Lahsen, M., Turnhout, E., 2021. How norms, needs, and power in science obstruct transformations towards sustainability. Environ. Res. Lett. 16 (2), 025008. https://doi.org/10.1088/1748-9326/abdcf0.
Levitas, R., 2013. Utopia as Method. Palgrave Macmillan UK. https://doi.org/10.1057/9781137314253.
Liboiron, M., 2021. Pollution Is Colonialism. Duke University Press. https://doi.org/10.1215/9781478021445.
Lotz-Sisitka, H., Wals, A.E., Kronlid, D., McGarry, D., 2015. Transformative, transgressive social learning: Rethinking higher education pedagogy in times of systemic global dysfunction. Sustain. Sci. 16, 73–80. https://doi.org/10.1016/j.cosust.2015.07.018.
Maas, T.Y., Montana, J., van der Hel, S., Kowarsch, M., Tuinstra, W., Schoolenberg, M., Mahony, M., Lucas, P.L., Kok, M., Bakkes, J., Turnhout, E., 2021. Effectively empowering: A different look at bolstering the effectiveness of global environmental assessments. Environ. Sci. & Policy 123, 210–219. https://doi.org/10.1016/j.envsci.2021.05.024.
Maas, T.Y., Pauwelussen, A., Turnhout, E., 2026. Politicizing expertise for Dutch Broad Wellbeing: Knowledge accountability for transformative change. Sci. Technol. & Human. Values. https://doi.org/10.1177/0162243926145024.
Machado de Oliveira, V., 2021. Hospicing modernity: Facing humanity's wrongs and the implications for social activism. North Atlantic Books.
Massarella, K., Krauss, J.E., Kiwango, W., Fletcher, R., 2022. Exploring Convivial Conservation in Theory and Practice: Possibilities and Challenges for a Transformative Approach to Biodiversity Conservation. Conserv. Soc. 20 (2), 59–68. https://doi.org/10.4103/cs.cs_53_22.
McElwee, P., Fernández-Llamazares, Á., Aumeeruddy-Thomas, Y., Babai, D., Bates, P., Galvin, K., Guèze, M., Liu, J., Molnár, Z., Ngo, H.T., Reyes-García, V., Roy Chowdhury, R., Samakov, A., Shrestha, U.B., Díaz, S., Brondízio, E.S., 2020. Working with Indigenous and local knowledge (ILK) in large-scale ecological assessments: Reviewing the experience of the IPBES Global Assessment. J. Appl. Ecol. 57 (9), 1666–1676. https://doi.org/10.1111/1365-2664.13705.
McGoey, L., 2019. The Unknowers: How Strategic Ignorance Rules the World. Zed Books Ltd. https://doi.org/10.5040/9781350225725.
Mehta, L., Oxley, N., Bose, S., Bhatt, M., Ohte, N., Joshi, P., Movik, S., Banani, M., 2025. Co-production and transformative change: Lessons and challenges. Glob. Social. Chall. J. 1–30. https://doi.org/10.1332/27523349Y2025D000000048.
Mervis, J., Pérez Ortega, R., 2024. Study Braid. Indig. West. Knowl. collapses acrimony. Sci. https://doi.org/10.1126/science.zb6zbbg, 25 July.
Miyake, K.K., 2024. Abolition-democracy and the future of climate change. Environ. Plan. E Nat. Space 7 (6), 2365–2385. https://doi.org/10.1177/25148486241287028.
Montana, J., Welden, E.A., Anderson, L.M., Bennett, A., Byfuglien, A., Bhalla, S., Fair, H., Greenhough, B., Hafferty, C., Hirons, M., Kumeh, E.M., Maguire-Rajpaul, V., McDermott, C.L., Mulyani, M., Picot, L., 2025. Ten facts from critical and interpretive social sciences for environmental research. iScience 28 (6), 112736. https://doi.org/10.1016/j.isci.2025.112736.
Monticelli, L. (Ed.), 2024. The future is now: An introduction to prefigurative politics. Bristol University Press.
Montuori, A., 2012. Creative Inquiry: Confronting the challenges of scholarship in the 21st century. Spec. Issue. Futures Educ. 44 (1), 64–70. https://doi.org/10.1016/j.futures.2011.08.008.
Moser, S., 2024. Social Transformations to Sustainability through a Critical Lens: Integrative insights from twelve research projects funded under the Transformations to Sustainability research programme (2018–2022). International Science Council. https://doi.org/10.24948/2024.03.
Newell, P., Twena, M., Daley, F., 2021. Scaling behaviour change for a 1.5-degree world: Challenges and opportunities. Glob. Sustain. 4, e22. https://doi.org/10.1017/sus.2021.23.
Overland, I., Sovacool, B.K., 2020. The misallocation of climate research funding. Energy Res. & Social. Sci. 62, 101349. https://doi.org/10.1016/j.erss.2019.101349.
Penca, J., 2023. Public authorities for transformative change: Integration principle in public funding. Biodivers. Conserv. 32 (11), 3615–3639. https://doi.org/10.1007/s10531-023-02542-w.
Pereira, L.M., Ortuño Crespo, G., Amon, D.J., Badhe, R., Bandeira, S., Bengtsson, F., Boettcher, M., Carmine, G., Cheung, W.W.L., Chibwe, B., Dunn, D., Gasalla, M.A., Halouani, G., Johnson, D.E., Jouffray, J.-B., Juri, S., Keys, P.W., Lübker, H.M., Merrie, A.S., Zhou, W., 2023. The living infinite: Envisioning futures for transformed human-nature relationships on the high seas. Mar. Policy 153, 105644. https://doi.org/10.1016/j.marpol.2023.105644.
Pires, A.P.F., Amaral, A.G., Padgurschi, M.C.G., Joly, C.A., Scarano, F.R., 2018. Biodiversity research still falls short of creating links with ecosystem services and human well-being in a global hotspot. Ecosyst. Serv. 34, 68–73. https://doi.org/10.1016/j.ecoser.2018.10.001.
Quijano, A., 2007. COLONIALITY AND MODERNITY/RATIONALITY. Cult. Stud. 21 (2–3), 168–178. https://doi.org/10.1080/09502380601164353.
Ramcilovic-Suominen, S., Giuntoli, J., Oliver, T., Mehta, L., 2025. How can relational, decolonial and feminist approaches inform the EU bioeconomy? Sustain. Sci. 20 (2), 649–657. https://doi.org/10.1007/s11625-024-01613-3.
Rayner, S., 2012. Uncomfortable knowledge: The social construction of ignorance in science and environmental policy discourses. Econ. Soc. 41 (1), 107–125. https://doi.org/10.1080/03085147.2011.637335.
Ressiore, C., A., Lima, C.L.S., Turnhout, E., 2024. Care narratives: Babassu breakers and mother palm trees. Geoforum 156, 104109. https://doi.org/10.1016/j.geoforum.2024.104109.
Ressiore, C., A., Fusco, G.D., Ludwig, D., El-Hani, C.N., Turnhout, E., 2025. Caring policy-relevant knowledge? The case of the Brazilian Platform for Biodiversity and Ecosystem Services. Environ. Sci. & Policy 171, 104170. https://doi.org/10.1016/j.envsci.2025.104170.
Reyes-García, V., Benyei, P., 2019. Indigenous knowledge for conservation. Nat. Sustain. 2 (8), 657–658. https://doi.org/10.1038/s41893-019-0341-z.
Reyes-García, V., Krug, R.M., Agrawal, A., Benessaiah, K., Bonilla-Moheno, M., Claudet, J., Forsyth, T., Garibaldi, L.A., Gemmill-Herren, B., Guibal, C., Goldstein, B. E., Gosnell, H., Guo, X., Huntjens, P., Ifejika Speranza, C., Leventon, J., Lima, L.S., Magris, R.A., Miwa, K., Molina, J.L., O'Brien, K., Pandit, R., Pereira, L., Raab, K.,

Scheidel, A., Tittonell, P., Ugarte-Lucas, P., Villasante, S., Zinngrebe, Y., 2026a. Actions and actors driving transformative change for global sustainability. Nat. Sustain. 9, 595–603. https://doi.org/10.1038/s41893-026-01783-1 in press.

Reyes-García, V., Villasante, S., Benessaiah, K., Pandit, R., Agrawal, A., Claudet, J., Garibaldi, L.A., Kabisa, M., Pereira, L., Zinngrebe, Y., 2025. The costs of subsidies and externalities of economic activities driving nature decline. Ambio 54 (7), 1128–1141. https://doi.org/10.1007/s13280-025-02147-3.

Reyes-García, V., Nelson, V., Bonilla-Moheno, M., Hausner, V., Leventon, J., Wheeler, H., Aksoy, Z., Bates, P., Carino, J., Dabezies, L.M., Frantzeskaki, N., Gordon, E., Gosnell, H., Guibal, C., Gurung, J., Heatta, M., Hernandez, Y., Huambachano, M., Ifejika Speranza, C., Magris, R.A., Mannetti, L., Mansur, A., Nishi, M., O'Brien, K., Pictou, S., Raab, K., Roskruge, N., Sulyandziga, R., Villasante, S., 2026. Indigenous Peoples and local communities as agents of transformative change for sustainability. Commun. Earth & Environ. https://doi.org/10.1038/s43247-025-03098-z.

Roberts, J.T., Milani, C.R.S., Jacquet, J., Downie, C. (Eds.), 2025. Climate Obstruction: A Global Assessment. Oxford University Press. https://doi.org/10.1093/oso/9780197787144.001.0001.

Salomaa, A., Juhola, S., 2020. How to assess sustainability transformations: A review. Glob. Sustain. 3, e24. https://doi.org/10.1017/sus.2020.17.

Scoones, I., Stirling, A., Abrol, D., Atela, J., Charli-Joseph, L., Eakin, H., Ely, A., Olsson, P., Pereira, L., Priya, R., van Zwanenberg, P., Yang, L., 2020. Transformations to sustainability: Combining structural, systemic and enabling approaches. Curr. Opin. Environ. Sustain. 42, 65–75. https://doi.org/10.1016/j.cosust.2019.12.004.

Serafini, P., 2022. Creating worlds otherwise: Art, collective action and (post) extractivism. Vanderbilt University Press.

Stevance, A.-S., Bridgewater, P., Louafi, S., King, N., Beard Jr., T.D., Van Jaarsveld, A.S., Ofir, Z., Kohsaka, R., Jenderedijan, K., Rosales Benites, M., Mulongoy, K.J., Chaudhari, K.L., Painter, J., Meter, A., 2020. The 2019 review of IPBES and future priorities: Reaching beyond assessment to enhance policy impact. Ecosyst. People 16 (1), 70–77. https://doi.org/10.1080/26395916.2019.1702590.

Stirling, A., 2019. How deep is incumbency? A 'configuring fields' approach to redistributing and reorienting power in socio-material change. Energy Res. & Social. Sci. 58, 101239.

Stoddard, I., Anderson, K., Capstick, S., Carton, W., Depledge, J., Facer, K., Gough, C., Hache, F., Hoolohan, C., Hultman, M., Hällström, N., Kartha, S., Klinsky, S., Kuchler, M., Lövbrand, E., Nasiritousi, N., Newell, P., Peters, G.P., Sokona, Y., Williams, M., 2021. Three Decades of Climate Mitigation: Why Haven't We Bent the Global Emissions Curve? Issue Volume 46, 2021 Annu. Rev. Environ. Resour. 46, 653–689. https://doi.org/10.1146/annurev-environ-012220-011104.

Stokland, H.B., Stenseke, M., Emery, M.R., 2022. A network to enhance the contributions from the social sciences and humanities to IPBES. Ecosyst. People 18 (1), 95–98. https://doi.org/10.1080/26395916.2022.2034971.

Stokland, H.B., Aspøy, H., Krange, O., Skogen, K., 2023. Warranty for a better world? The politics of environmental knowledge in bioeconomic sustainability certificates. Ambio 52, 1056–1064.

Stokland, H.B., Vadrot, A., Barron, E.S., Beck, S., Emery, M.R., Lidskog, R., Maas, T., Montana, J., Sandström, C., Stenseke, M., Stirling, A., Stoett, P., Turnhout, E., 2026. Making global environmental assessments fit for future challenges. Environ. Sci. & Policy 180, 104389.

Sultana, F., 2022. The unbearable heaviness of climate coloniality. Political Geogr. 99, 102638. https://doi.org/10.1016/j.polgeo.2022.102638.

Tadaki, M., Brierley, G., Dickson, M., Le Heron, R., Salmond, J., 2015. Cultivating critical practices in physical geography. Geogr. J. 181 (2), 160–171. https://doi.org/10.1111/geoj.12082.

Terry, N., Castro, A., Chibwe, B., Karuri-Sebina, G., Savu, C., Pereira, L., 2024. Inviting a decolonial praxis for future imaginaries of nature: Introducing the Entangled Time Tree. Environ. Sci. & Policy 151, 103615. https://doi.org/10.1016/j.envsci.2023.103615.

The Global-Hub on Indigenous Peoples' Food Systems, 2021. Rethinking hierarchies of evidence for sustainable food systems. Nat. Food 2 (11), 843–845. https://doi.org/10.1038/s43016-021-00388-5.

Theis, N.G., Light, R., 2024. Surveying the landscape of environmental social science: A bibliometric and network analysis. Environ. Res. Commun. 6 (6), 061003. https://doi.org/10.1088/2515-7620/ad495d.

Turnhout, E., Lahsen, M., 2022. Transforming environmental research to avoid tragedy. Clim. Dev. 14 (9), 834–838. https://doi.org/10.1080/17565529.2022.2062287.

Turnhout, E., Lynch, C.R., 2025. Raising the carbonized forest: Science and technologies of singularization. Environ. Plan. F. 4 (2), 111–123. https://doi.org/10.1177/26349825241255685.

van den Berg, L., Teixeira, H.M., Behagel, J.H., Verschoor, G., Turnhout, E., Cardoso, I. M., Botelho, M.I.V., 2022. From managing transitions towards building movements of affect: Advancing agroecological practices and transformation in Brazil. Geoforum 131, 50–60. https://doi.org/10.1016/j.geoforum.2022.02.011.

Visseren-Hamakers, I.J., Razzaque, J., McElwee, P., Turnhout, E., Kelemen, E., Rusch, G. M., Fernández-Llamazares, Á., Chan, I., Lim, M., Islar, M., Gautam, A.P., Williams, M., Mungatana, E., Karim, M.S., Muradian, R., Gerber, L.R., Lui, G., Liu, J., Spangenberg, J.H., Zaleski, D., 2021. Transformative governance of biodiversity: Insights for sustainable development. Curr. Opin. Environ. Sustain. 53, 20–28. https://doi.org/10.1016/j.cosust.2021.06.002.

Walter, M., Scheidel, A., Vadez, C., Del Bene, D., Temper, L., Fanari, E., Reyes-Garcia, V., 2026. Social movements are transformative agents for biodiversity conservation. Proc. Natl. Acad. Sci. 123 (e2513327123).

Whitmarsh, L., Poortinga, W., Capstick, S., 2021. Behaviour change to address climate change. Psychol. Clim. Change (2021) 42, 76–81. https://doi.org/10.1016/j.copsyc.2021.04.002.

Winkler-Schor, S., Eyster, H.N., Lobo, D., Redmore, L., Wright, A.J., Lukasik, V.M., Chávez-Páez, W., Tully, B., Beard, S., Blount-Hill, K.-L., Christen, C., Nyssa, Z., 2024. Enhancing disciplinary diversity and inclusion in conservation science and practice based on a case study of the Society for Conservation Biology. Conserv. Biol. 38 (6), e14395. https://doi.org/10.1111/cobi.14395.