



Effectively empowering: A different look at bolstering the effectiveness of global environmental assessments

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ABSTRACT

Global environmental assessments are widely considered to play a prominent role in environmental governance. However, they are also criticised for a lack of effectiveness in informing policy and decision-making. In response, GEAs have adopted a number of strategies to bolster their effectiveness, including by orienting themselves towards solutions (solution-orientation), increasing the diversity of included experts (participation), and producing more targeted assessments (contextualisation). In this article, we analyse these strategies as attempts to be effective for multiple audiences while also identifying the limitations of these strategies. Based on this analysis, we propose to conceive of GEAs as processes that are able to empower diverse actors – ranging from diplomats in international negotiations to civil society activists, or indigenous and local knowledge holders – to act towards socio-environmental objectives. Seen in this light, the effectiveness of GEAs can be improved by reflecting on which actors can benefit from assessments and how assessments can contribute to their empowerment. This strategy goes beyond current proposals that aim to strengthen the authority of assessments by boosting the scientific quality and credibility of the reports. Indeed, it complements them with an explicitly political perspective. Using examples of empowerment in different phases of GEA production and use, we argue that this reconceptualisation of effectiveness requires assessments to reflect a diversity of problem and solution frames, thereby creating entry points for the empowerment of a broad range of actors. We conclude by providing three illustrative ideas to improve effectiveness for the design and execution of assessments.

1. Introduction

Global Environmental Assessments (GEAs) play a prominent role in global environmental governance (Biermann, 2002; Cash et al., 2003; Rothman et al., 2009; van der Hel and Biermann, 2017). GEAs assemble and synthesise the state-of-the-art of fragmented scientific knowledge to provide insight and add meaning to policy-relevant questions (Jabbour and Flachsland, 2017; Mitchell et al., 2006). In this way, they ultimately

aim to improve socio-environmental outcomes, even if their aim to be ‘policy relevant, not prescriptive’ means they ostensibly strive to be agnostic to exactly what the best socio-environmental outcome or the best way to achieve that outcome might be (Rothman et al., 2009; Turnhout et al., 2016; van der Hel, 2018). GEAs are commonly institutionalised processes with specific practices and governance structures, such as the Intergovernmental Panel on Climate Change (IPCC) or the Intergovernmental Science-Policy Platform on Biodiversity and

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Ecosystem Services (IPBES). Such assessments are generally considered to have significantly contributed to environmental decision-making, e.g. the IPCC to the Paris Climate Agreement, the fifth Global Environment Outlook to the 2030 Agenda for Sustainable Development, and IPBES' Global Assessment to currently ongoing negotiations in the Convention on Biological Diversity (Carraro et al., 2015; Gustafsson, 2019; Kowarsch et al., 2017b; Kowarsch and Jabbour, 2017; Oppenheimer et al., 2019). Despite this wide acknowledgement of their importance, there is persistent debate on the 'effectiveness', 'impact', or 'influence' of GEAs (Alcamo, 2017; Borie et al., 2020; Farrell and Jäger, 2006; Livingston et al., 2018; Mitchell et al., 2006; Rioussset et al., 2017; Sarkki et al., 2019). While this is often seen as a matter of uptake into policy (i.e. the implementation of a GEA's key messages into policy measures), commentators have also argued the effectiveness of GEAs is being limited because of a lack of acknowledgement of the political role of knowledge (Beck et al., 2014; Turnhout et al., 2016) and for seeking consensus outcomes that are proclaimed to be value-free (Scoones, 2009; van der Sluijs et al., 2010; Castree et al., 2020). These limitations are difficult to overcome because they are embedded in the institutional structures of assessments, which reflect deeply held beliefs about what constitutes relevant knowledge and how science and policy should relate (Díaz-Reviriego et al., 2019; Montana, 2020; Lahsen and Turnhout, 2021).

These debates have played out in GEAs in various ways, ranging from the development of principles to guide assessment processes (IPBES, 2016a; Pintér et al., 2012), instituting a task force on the future of an assessment body (Thoni and Livingston, 2019; UNEP, 2019), to the way the design of IPBES builds on lessons learned in the IPCC (Montana, 2020). Much scholarship on the effectiveness of GEAs implicitly assumes their influence arises in well-defined settings of decision-making, such as in national legislatures or multilateral negotiations. However, scholarship has shown that the influence on decision-making of expertise from GEAs and other expert bodies can take different forms. A long-term study of the Royal Commission on Environmental Pollution in the UK, for example, found the influence of this national-level expert body ranged from rapid adoption of recommendations to diffuse 'atmospheric' influence that is impossible to tease out from other sources (Owens, 2012). This picture is further complicated when we consider that GEAs engage with a heterogeneous global audience, whose cultures and traditions of decision-making can vary widely (Miller, 2007). Indeed, a comparative study of GEAs found that their impact might be best understood as shaping policy discourse, whereby GEAs contribute to policy learning and scientific literacy (Rioussset et al., 2017). It is therefore pertinent to look for alternative ways of considering effectiveness that go beyond direct transfer to policy objectives in familiar settings like international conventions or through so-called national focal points liaising between assessments and national governments, and to take account of the way that GEAs may also be contributing to a process of enabling diverse actors to enact their own forms of agency in the decision-making settings that matter most to them (following what Scoones et al., 2020 have dubbed "enabling approaches" to transformation).

This paper provides such an alternative understanding of the effectiveness of GEAs, by considering GEAs as processes able to empower diverse actors – e.g. in national and local government, civil society, the private sector and indigenous communities – to act towards socio-environmental objectives. Consequently, this means that GEAs can increase their effectiveness by attending more explicitly to who they empower and how. At the same time, this understanding foregrounds normative and political questions about what effectiveness is desirable and which actors and whose actions GEAs support. We provide three examples of how such an understanding of the effectiveness of GEAs can be operationalised in different phases of GEA production and use. We conclude by discussing the implications of fostering the empowerment function for the design and execution of assessments.

2. Efforts to improve effectiveness

Efforts to bolster GEA effectiveness can be characterised as following one of three strategies, both in GEA practice and in the literature on GEAs, which we label solution-orientation, participation, and contextualisation. Here, we discuss these three strategies, as well as how effectiveness stems from more than the assessment reports themselves.

2.1. Solution-orientation

In the first strategy to bolster effectiveness, there is a changing emphasis towards solution-oriented assessments (Kowarsch and Jabbour, 2017). Whereas past assessments often primarily focused on problem definitions and the 'status and trends' of environmental issues relative to potential goals, recent assessments complement this focus with significant attention to assessing and presenting different solution pathways and possible policies by which to meet globally agreed goals and targets (Kowarsch et al., 2017b; van Vuuren et al., 2012). This strategy can be seen as linked to an evolving environmental governance context moving from agenda- and target-setting towards policy formulation, implementation and evaluation (Jabbour and Flachsland, 2017). Yet, this strategy may be hindered by the way assessments commonly operationalise the concept of consensus. Consensus in a GEA can contribute to its effectiveness, particularly in relation to signalling environmental problems, or when approached in the form of 'meta-consensus', indicating recognition that different legitimate positions regarding values, beliefs, and policy options exist (Dryzek and Niemeyer, 2006). However, the approach to consensus in GEAs becomes more problematic when it comes to solutions since it is seemingly predicated on the idea that policy action follows from equivocal and objective scientific input on what range of solutions is available. This can be counterproductive because it results in GEAs steering clear of the normative dimensions these solutions entail (van der Sluijs et al., 2010; Edenhofer and Kowarsch, 2015; Castree et al., 2020). GEAs thereby risk closing down political debate prematurely, instead of contributing to moving that debate forward (Pearce et al., 2017; Turnhout et al., 2020).

2.2. Participation

In the second strategy to bolster effectiveness, many GEAs attempt to increase the diversity of experts included by focusing on participation. Attaining diversity in participating experts is seen as important for the acceptance of the assessment by different states (Garard and Kowarsch, 2017) as well as for creating a 'balance of bias' that is seen to contribute to the assessment's objectivity (Oppenheimer et al., 2019). Furthermore, increased diversity is seen to contribute additional expertise required, which links to the strategy of solution-orientation. Yet, GEAs have historically struggled to include a diverse array of experts (Ho-Lem et al., 2011; Timpte et al., 2018; Yamineva, 2017). Shifting the emphasis towards solutions means that assessments increasingly discuss socio-economic and political dynamics, for which in turn they seek a greater contribution of social scientific expertise (e.g. Stenseke and Larigauderie, 2018). Moreover, there is growing acknowledgement of the possible contribution of indigenous and local knowledge to GEAs, for which IPBES is widely cited as a frontrunner by having adopted specific procedures to this end (Montana and Borie, 2016). Nonetheless, the degree to which the strategy of participation has led to greater diversity is limited, including because of the powerful position of member states (Díaz-Reviriego et al., 2019), an instrumentalist operationalisation that employs strict rules to balance involvement of different experts (Garard and Kowarsch, 2017; Montana, 2017) and the persistence of principles of scientific autonomy and consensus (Esguerra and van der Hel, 2021). The inherently global orientation of the problem framing and preconceived indicator frameworks of GEAs do not necessarily match with e.g. indigenous and local knowledge frames. Adapting existing procedures to facilitate the integration of alternative forms of knowledge turns out to

be a challenge in practice. This limits the extent to which a diversity of knowledge is actually reflected in GEAs and their messages.

2.3. Contextualisation

In the third strategy to bolster effectiveness, GEAs focus on contextualisation by attempting to connect to national and local contexts through regional reports (e.g. the *Global Environment Outlook*, the *IPBES Regional Assessments*, *Millennium Ecosystem Assessment*) or through reports targeting specific types of policymakers, e.g. at the local and regional level (e.g. within *The Economics of Ecosystems and Biodiversity* and in a planned *IPCC Special Report on Cities*) or in business (in an upcoming *IPBES report on Business and Biodiversity*). These attempts can be seen to respond to earlier critiques pointing to the difficulty of making the globalised knowledge GEAs typically develop useful in local or specific policy contexts (Hulme, 2010; Jasanoff and Martello, 2004; Turnhout et al., 2016). Yet, in practice, the ability of this strategy to actually improve localised decision-making is often hampered by the fact that these attempts tend to remain either a method to obtain staggered input to a global synthesis report or a spin-off, rather than a fully-fledged assessment itself. Ultimately, GEAs tend to be poorly connected to local and national ecosystems of science for policy which might otherwise be well-positioned to mobilise an assessment (Görg et al., 2016).

2.4. Effectiveness beyond assessment reports

These three strategies reflect a rising interest in the effectiveness of GEAs and an increasing recognition that this effectiveness is not just a matter of improving their end-products: the assessment reports. Even if the successful achievement of these strategies still faces limitations in practice, they highlight the equal importance of reflecting on and improving the practices, processes and institutions that shape assessments (Bakkes et al., 2019; Farrell et al., 2001; Jabbour and Flachsland, 2017). Going beyond assessment reports in thinking about the effectiveness of GEAs necessitates recognition that GEAs involve a swathe of actors that contribute to their work, from governmental representatives to chapter scientists. GEAs are typically large networks of actors, from both science and policy communities, which collectively constitute the ‘macro-actor’ of each GEA (cf. Callon and Latour, 1981). These complex networks are crucial to the authority of GEAs and the circulation of their outcomes (Castán Broto and Bulkeley, 2018; Montana, 2019).

This realisation holds the key for the further improvement of the effectiveness of GEAs and for letting the three strategies come to fruition. Rather than only focusing on enhancing the authority of assessments by strengthening the credibility and validity of the reports, improving the effectiveness of GEAs can also focus on the way in which assessment processes are able to catalyse the generation of meaning within the networks and actors involved (Dewulf et al., 2020; Montana, 2020). Here, meaning refers to the ability “to construct a comprehensive, grounded and deliberative understanding” of environmental issues (Montana, 2020, p. 245). With this emphasis on meaning, we intend to go beyond more established approaches to improving GEAs which have tended to end up being used to reduce the question of effectiveness to procedural ‘checkboxes’ to tick on criteria like relevance, credibility, and legitimacy (Cash et al., 2003; Farrell and Jäger, 2006; Owens, 2015; van der Hel and Biermann, 2017), neglecting the many different ways through which GEAs can contribute to socio-environmental outcomes. Such a perspective on effectiveness should put the questions of what effectiveness is desirable and whose actions GEAs support and catalyse centre stage. Indeed, both expertise itself and the organisational logics that guide expert bodies, including GEAs, reflect and are shaped by “beliefs and values about the world [they are] seeking to describe” (Mahony and Hulme, 2018, p. 16) while actively shaping that world in the process (Jasanoff, 2004). This means expertise and expert bodies produce political effects and thus necessitates reflection on who is

empowered by the production of this expertise (Turnhout et al., 2019).

3. Global environmental assessments as empowering processes

For GEAs to harness their potential to contribute towards socio-environmental objectives, they need to consider how they can empower actors and stakeholders in policy and society. We recognise that the concept of empowerment has a wide variety of uses and interpretations in different disciplines including development studies, feminist studies, and transition studies (Avelino and Wittmayer, 2016; Batliwala, 2007; Cornwall and Brock, 2005; Smith and Raven, 2012). These interpretations range between fairly instrumental conceptions of empowerment that tend to focus on the building of actors’ capacities to achieve pre-defined outcomes and objectives, and more radical and explicitly political notions of empowerment that prioritise the redistribution of power and the creation of autonomy and self-determination. In this paper, we take the latter approach out of a recognition of the political character of GEAs and their potential to catalyse diverse political actions. In this way, and building on other work in science and technology studies, we take empowerment to denote the political agency that arises when actors draw on the representative power of the GEA-network in interactions with other actors (Callon and Law, 2004; Latour, 2005). Because this definition centres on interactions, empowerment works bi-directionally, but also requires the opportunity of interaction to be present.

The way GEA processes are organised favours empowerment of certain actors rather than others. An obvious example concerns the way summaries for policymakers are negotiated: including government representatives but not civil society or industry organisations. More subtly, institutionalised problem frames may exclude certain actors from benefitting from the assessment by inhibiting them from perceiving the assessment as relevant to their own concerns and actions (Beck, 2019). For example, a framing of climate change as a global commons problem to be solved by global collective action limits the scope for possible solutions found at a more local or regional level (Hulme, 2015).

After all, it has long been recognised that environmental governance, that which GEAs are intended to inform and support, is not solely conducted through state-centric modes but rather is a polycentric and distributed affair (Ostrom, 2010). Numerous kinds of actors, including sub-national governments, cities, civil society, and private corporations, at all kinds of levels (e.g. local, regional, transnational) are involved in environmental decision-making and are governing themselves through private governance arrangements (Bevir, 2010; Burch et al., 2019; Hajer et al., 2015). Their actions shape the same socio-environmental outcomes that GEAs also ultimately aim to affect. However, whereas we can get a general impression of the role GEAs play in the multilateral system, this is much more difficult – if not outright impossible – for the full spectrum of governance beyond the state. Nonetheless, it goes without saying that the multilateral orientation in the design of GEAs has consequences for empowerment in other parts of the environmental governance landscape.

To strengthen their effectiveness, GEAs need to empower and be relevant and actionable for a broader part of the environmental governance landscape than the multilateral system alone (Beck and Mahony, 2018). Rather than simply advancing a global longue-durée perspective on environmental issues (Jasanoff, 2010), they arguably need to more meaningfully connect with the scales and temporalities of existing social and political institutions. A recurrent issue here is the degree to which GEAs can be inclusive and accommodate different problem and solution frames as fundamental enablers of the empowerment of a wide variety of actors.

There can be good reasons to create more opportunities for certain forms of empowerment than for others. Since it is impossible to actively facilitate ‘all’ forms of empowerment, assessment procedures are inevitably compromises between how different actors in a GEA network expect them to help meet their goals successfully (Alcamo, 2017). The

challenge GEAs face is thus not to empower all actors equally, but rather to consider who and what they empower, and with what legitimacy. We contend that explicit attention to these questions will yield opportunities to broaden empowerment and thereby lead to effectiveness beyond a mere focus on strengthening the authority of the reports. In this way, this approach fosters a reflexive attitude to effectiveness, i.e. one which defines effectiveness of the GEA in relation to which actors are being enabled “to take action on their own behalf” (Scoones et al., 2020).

4. Identifying empowerment in and through GEAs

Approaching GEA effectiveness through the lens of empowerment opens up a way of evaluating their performance by providing plausible narratives of empowerment which are able to accommodate ‘atmospheric’ influence rather than striving to causally link GEAs to specific impacts (cf. Owens, 2012; van Wessel, 2018). In this way, it is possible to illustrate how GEAs are already realising empowerment in different ways in practice. This section provides a number of examples in which empowerment takes place, summarised in Table 1, for which we distinguish three phases of GEAs: the scoping phase, the production phase, and the use phase. We intend these phases to be a heuristic that is recognisable to GEA-practitioners, so as to highlight the potential for empowerment found throughout the GEA-process.

First, the **scoping phase**, which determines the questions a particular assessment process is asked to answer. In or at the conclusion of this phase, experts holding relevant knowledge to these questions are selected to contribute to the assessment process. This phase therefore also importantly involves considerations over which expertise is considered relevant. Furthermore, as part of the scoping phase of many GEA-bodies, draft tables of contents and outlines of the report are created, and particular requests may be made for certain sources of information to be included. An example of how empowerment can function through the scoping phase is the Paris Climate Agreement’s request to the IPCC to produce a report on 1.5 degrees of warming. This request can be seen as part of wider and longer-term advocacy by small-island developing states (SIDS) and other actors to reframe the discussion on ‘maximum acceptable global warming’ away from the previously-

dominant 2-degree target (Bjermeland, 2021; Livingston and Rummukainen, 2020; Randalls, 2010). While SIDS are of course part of the multilateral system, they arguably have limited influence in it. As a result, the IPCC’s acceptance to explicitly examine the difference between 1.5 and 2 degrees of warming has helped to empower SIDS and their position in the political discussion, by leveraging the network of scientists and policymakers the IPCC is composed of to engage with the different target in political discussions, as well as increase scientific research engaging specifically with a 1.5-degree target (Livingston and Rummukainen, 2020). Empowerment thus works in two directions, by strengthening the position of a relatively marginal group of actors and by stimulating a shift in the knowledge base of the GEA.

Second, during the **production phase**, the main assessment process takes place. Contributors to the assessment synthesise the materials relevant to answer the questions as defined in the scoping phase and a Summary for Policymakers is usually created, in some cases involving governments negotiating its contents with the authors of the underlying report. An example of empowerment in this phase is how the IPBES’ conceptual framework validates different knowledge systems for legitimate use in its assessments (Borie and Hulme, 2015; Stenseke and Larigauderie, 2018). Recognising that indigenous and local knowledge, as well as the social sciences and humanities, have important contributions alongside the natural sciences can empower local and context-specific actions (Turnhout et al., 2012). Another example is the IPCC’s decision to produce a Special Report on Climate Change and Cities in its 7th Assessment Cycle at the request of various city networks, potentially empowering urban decision-makers in climate change-related actions (IPCC, 2016; ISOCARP, 2016). In both these examples, diverse forms of knowledge and actors are acknowledged to be able to make a relevant contribution to environmental governance by interacting with GEA processes – including by actors being empowered to make the knowledge GEAs produce more relevant to themselves.

Third, the **use phase**. This includes the assessment report and its summary(s), as well as spin-off products and communication output like press releases. Whereas in the scoping and production phases the GEA process is crucial for empowerment, in this final phase the written output of the assessment can also play an important role in facilitating empowerment (cf. Weisser, 2014). To some extent, these examples echo the traditional approach to effectiveness as centring on a GEA’s authority and also exemplify how it can matter that GEAs establish a form of consensus. The point here however is to illustrate how actors not involved with the GEA process are nonetheless able to enact agency by interacting with it. For instance, we can think of how Greta Thunberg arguably won her status as poster child for progressive climate politics in part through statements that the world should “listen to the scientists” at prominent forums such as the United Nations General Assembly and World Economic Forum, and submitting the IPCC Special Report on 1.5 degrees as her testimony in a United States congressional hearing (Milman and Smith, 2019). Also the Dutch NGO Urgenda can be seen to have been empowered by the IPCC’s reports. In a landmark court case in the Netherlands, the Supreme Court ruled in favour of Urgenda, ordering the Dutch government to increase climate action. In their ruling, the Court adopted part of the NGO’s argumentation based on the IPCC’s 4th and 5th assessment reports (Nollkaemper and Burgers, 2020). While neither Thunberg’s status nor Urgenda’s victory can be fully attributed to the IPCC, it should certainly be seen to have contributed to both cases, i.e. both examples would have been difficult to imagine without the IPCC. This highlights that empowerment is not reducible to a transfer of power but arises in the interaction. A third and rather different example of empowerment in the use phase, is how particularly during the late 1990s and early 2000s, UNEP’s Global Environment Outlook is described to have inspired hundreds of local and regional ‘spin-off’ reports throughout the Global South (Bakkes et al., 2019), suggesting its system of environmental assessment empowered capacity building for environmental policy in many places and settings. This example reiterates that empowerment includes highly diffuse forms of

Table 1
Examples of empowerment in different phases.

Phase	Examples of empowerment	Who is empowered	How does the GEA process empower?
Scoping phase	IPCC: 1.5 °C and the small island developing states	Small-island development states	Supports scientific & political discursive shift to 1.5 °C, instead of focus on 2 °C
	IPBES: validation of indigenous and local knowledge (ILK), social sciences, and humanities (SSH)	Diverse knowledge holders and their contributions to environmental governance	Different types of knowledge are seen as relevant to protecting biodiversity
Production phase	IPCC: urban climate governance	Decision makers at urban scale	Developing knowledge that is meaningful at the urban scale supports climate action
	IPCC: Greta Thunberg and Dutch NGO Urgenda	Advocacy actors	Actors use an assessment report to build a case for their advocacy work
Use phase	Global Environment Outlook (GEO): local and regional spin-offs	Decision makers at local and regional scales	Building local and regional capacity by using GEO process as a model for local environmental assessments

influence, in which socio-environmental outcomes depend on the way diverse actors enact their own agency (cf. Callison, 2014).

The examples we include here are obviously not exhaustive but serve to clarify how empowerment by GEAs takes place when actors draw on the GEA-network in interactions with other actors. Certainly, empowerment can also occur across different phases and assessments. For example, through creating experts that can bring their experience with past assessments to bear in new ones or use it to engage in activities like advising governments or testifying in parliamentary hearings (Borie et al., 2020; Gustafsson, 2021). We hope examples like these stimulate reflection on the opportunities offered by taking an empowerment approach to GEA effectiveness. In this, we also identify a task for analysts of GEAs to go beyond what goes on inside the Panels and their processes, and also follow GEAs out into the world. In what places are assessments mobilised other than well-studied multilateral environmental negotiations? How do their insights become meaningful in these contexts? Can more be said about who they empower and how? And how does empowerment in one phase affect the potential for empowerment in another phase or element of a GEA?

As already noted in the previous section, the way an assessment process is organised can favour empowerment of certain actors rather than others. For instance, since national governments commonly hold formal decision-making power in many GEAs (Díaz-Reviriego et al., 2019; Esguerra et al., 2017; Thoni and Livingston, 2019; Yamineva, 2017), the ability of other actors to influence the assessment in directions that may empower themselves is limited. So while in the scoping phase example, the fact that small-island states are sovereign states can be seen to have helped the pursuit of a 1.5-degree report, the examples from the production phase were already more dependent on ‘benevolence’ for potential contributions to be acknowledged. In the use phase, empowerment relates closely to the degree to which a diverse range of actors perceives the assessment as relevant to them and is able to draw on it. While GEA bodies may play a smaller role here, assessments can pro-actively facilitate such processes for non-traditional audiences through tailored communication outputs and by supporting meaningful contextualisation.

Crucially, the examples above illustrate that empowerment is never neutral. They stimulate reflection on the effectiveness of GEAs as relating to who is empowered. In this way, empowerment provides a way to think about opportunities to increase GEA effectiveness that go beyond simply strengthening their authority. This leads us to consider pluralism as an important quality of effective GEAs, since including different problem and solution frames enables the empowerment of a wide variety of actors. After all, each of the examples is characterised by a directionality that can be contested from certain angles. To highlight some of these: the inclusion of diverse forms of knowledge has been critiqued for being primarily about knowledges that can fit a single, integrated frame (Castree et al., 2014; Lövbrand et al., 2015); plenty of IPCC authors may frown on the way their work was mobilised in the Urgenda Court Case (based inter alia on IPCC reports, the Court found that consensus existed on the need for developed countries to achieve 25–40 % emission reduction, see also Nollkaemper and Burgers, 2020); and while we certainly admire Greta Thunberg’s zeal, we do so ambivalently, because her insistence on following a capital-S ‘Science’ is diametrically opposed to crucial tenets from science and technology studies which hold that political arguments cannot be linearly derived from scientific statements (cf. Fuller, 2017). In this respect, accommodating pluralism can be a way to improve the effectiveness of GEAs, because it embeds responsibility for the empowerment they facilitate. In the next section, we present three constructive and pragmatic ideas to improve effectiveness in this way.

5. Illustrative ideas for improving GEA effectiveness

Our argument that pluralism can improve the effectiveness of GEAs dovetails with pleas to transform global sustainability science in a way

that allows it to facilitate more explicit political debates about how to respond to socio-ecological challenges (Castree et al., 2014; Lövbrand et al., 2015; Castree et al., 2020; Lahsen and Turnhout, 2021). Arguably, such pleas have so far left a gap between what change they envisage and how that change is to be achieved. For instance, Castree et al. (2020) recently argued for far-reaching change in GEAs but subsequently limit their suggestions to several questions that future GEAs could answer. Because empowerment helps us to think of effectiveness throughout the GEA process, it provides a way to articulate the question of *how* change could be achieved more concretely. Here, we provide three illustrative ideas that can contribute to improving the effectiveness of GEAs. These ideas are the outcome of discussions held at a workshop on the role of GEAs at PBL Netherlands Environmental Assessment Agency in December 2019 and are rooted in the multidisciplinary academic literature on GEAs (see also Maas et al., 2020).

These ideas all aim to accommodate pluralism and thereby embed greater responsibility for empowerment within GEAs. Accommodating a diversity of problem and solution frames creates entry points for the exercise of political agency by enabling the broad range of actors playing a role in contemporary environmental governance to mobilise the GEA in their own actions. Moreover, accommodating pluralism in the GEA facilitates mutual learning processes about both governance problems and potential solutions, which can also empower actors of various stripes in the environmental governance arena (Kowarsch et al., 2016). In addition, mutual learning processes can create a shared knowledge that makes explicit not just the aspects on which consensus exist, but which also allows going beyond consensus towards multiple conditional perspectives, and towards empowering not only actors but also a broader range of knowledge systems themselves (Díaz-Reviriego et al., 2019; Kowarsch et al., 2017a; Stirling, 2010).

There is a risk in the empowerment approach to neglect structural constraints, thereby unduly burdening marginalised actors to spur their desired change (Scoones et al., 2020). We think embedding greater responsibility for empowerment within the GEA goes somewhat towards addressing that, because it makes these expert organisations responsible for creating the opportunities for empowerment that are an essential precondition for their effectiveness. It thereby also increases the ability for analysts and others to hold GEAs accountable for the empowerment that is facilitated in practice. This also depends on the degree to which changes like we propose can be adopted in GEA processes. This requires flexibility in GEAs to re-think their procedures, position and purpose, while recognising that the outcome will reflect the balance of power between actors with varying and sometimes contradicting needs. Although we feel that such a reflection is inevitable in the long term, we realise that in the short term and in the context of ongoing negotiation processes this might not always be feasible. The illustrative ideas below therefore have different levels of ambition in catering for alternative problem and solution frames as well as in their required shift in institutionalised GEA-procedures.

Furthermore, some actors in GEAs may be deterred by the prospect of broader empowerment, which could reduce their claims to authority derived from asserted political independence and a consensus-based account of reality. Greater pluralism will likely affect this form of authority in GEAs, particularly in multilateral settings. This is not without its possible costs. GEAs largely rely on government financial contributions for their operations, and those with an intergovernmental structure rely upon the continued buy-in of governments and the volunteered time of the scientific community to realise their work. However, in this light, the dynamics of seeking authority as commonly understood arguably primarily empowers already-dominant actors in environmental governance (Esguerra and van der Hel, 2021). We contend that limiting empowerment to only these actors is insufficient to weather contemporary socio-environmental challenges. Instead, the empowerment approach we put forward indicates that strategies for authority need not be as tied to effectiveness as has been suggested elsewhere (e.g. van der Hel and Biermann, 2017). Arguably, what matters most in

environmental governance is the ability of GEAs to contribute to socio-environmental outcomes. To achieve this, GEAs might consider working more towards empowerment, which will require a rethinking of what authority of expert organisations means (Esguerra and van der Hel, 2021) or indeed embracing multiple forms of authority to accommodate the diverse communities that they seek to serve (Montana, 2020).

Finally, before turning to the ideas, we stress that other options are certainly possible. Crucially, any further implementation of these ideas requires reflection on their operationalisation within the context of a particular GEA to avoid new procedural checkboxes arising (Chilvers and Kearnes, 2019). These ideas should thus be seen as pragmatic examples that can stimulate the reflexive attitude to effectiveness we have tried to expound amongst scholars and other GEA practitioners (see Table 2 for a summary overview).

5.1. Mapping diverse perspectives, values and ontologies

During the scoping phase, assessments could create a map of divergent perspectives relating to the subject of an assessment to facilitate diversity in problem and solution framings. This mapping identifies the range of different values and norms and their interpretation in particular contexts, as well as the different ways of knowing or ontologies in which these are embedded (Kenter et al., 2019). The objective is not to find the “right” or “most suitable” perspective but merely to cover as much of the breadth as possible, which benefits from a wide variety of experts and stakeholders to be involved in this mapping. Subsequently, the mapping provides a targeted point of departure for efforts to ensure diversity in the assessment. During the assessment’s production phase, this mapping can inform the assumptions, goals, constraints, and evaluation criteria used within GEA processes, such as within integrated assessment modelling. It would also allow for reflection on whether the assessment is representing the full breadth of previously identified perspectives, thereby functioning as a tool to help avoid particular perspectives from dominating the assessment. So, while in this option the onus to ensure the wide range of mapped perspectives is satisfactorily reflected in the assessment still lies largely with its authors, the mapping can empower authors from less dominant perspectives in the process to maintain a diversity of frames. In the use phase, this option allows policymakers and other actors to navigate an explicitly value-laden solution-space, because having the assessment’s conclusions be positioned in relation to different perspectives facilitates their usefulness and applicability in

different contexts. This approach reflects certain elements of the ‘cartography of pathways’ proposed by Edenhofer and Kowarsch (2015), in which researchers ‘map’ policy alternatives and their implications in light of diverse goals and values in order to illuminate the controversies and potential for policy overlap that decision-makers face. However, whereas the model they suggest develops a multi-stage iterative process that significantly departs from common GEA-practice, the approach we describe here could be a readily implementable way of diversifying and providing transparency on problem and solution framings. A practical example that resembles this approach is the ongoing IPBES Methodological Assessment on Values, which is assessing different conceptualisations of values of nature and its benefits, as well as methodologies by which to incorporate these into governance (see IPBES, 2018).

5.2. Envisioning desired futures and pathways

Another possible approach consists of developing a set of ways to envision the future and key pathways leading there from the current situation. Particularly in GEAs in which integrated assessment methods play a prominent role (van Beek et al., 2020), such a set could promote pluralism throughout an assessment’s scoping and production phase. Each of these visions may reach goals such as the Sustainable Development Goals and other more long-term objectives, but provide a tangible expression of the fact that several ways to reach these objectives exist in terms of economic structure and reliance on existing and expected technologies (van Vuuren et al., 2015). The combination of visions with pathways that could lead to them brings to the fore how they embed different perspectives and dependencies on e.g. particular technologies, institutions, policy instruments and behaviour. These visions and pathways can then provide a framework by which to structure the assessment. Whereas the previous idea functions by helping assessment authors work with different perspectives, this approach makes this diversity a visible and explicit part of the final product. Including the different visions and pathways in assessments levels the playing field among this diversity of perspectives while providing actors with a shared language. This creates improved possibilities for the political contestation of policy options and fosters learning about policy alternatives, leading to opportunities for the empowerment of a broad range of actors.

A concrete way to operationalise this option is to turn around the use of scenarios – an important element of many GEAs – so they can be explicitly used to explore desirable futures and possible ways to reach these (IPBES, 2016b). This approach resembles the work by the former expert group and current task force on scenarios and models of IPBES to develop a ‘Nature Futures Framework’ (NFF). The NFF means to allow the scientific community to develop new scenarios towards positive future trajectories for nature and nature’s contributions to people to be used in future IPBES assessments, at multiple scales and both quantitatively and qualitatively. The NFF is a heuristic tool based on the diverse, positive relationships humans have with nature, building iteratively on a combination of systematic outreach to a diversity of stakeholders, modelling and analysis (Pereira et al., 2020). Not only the ongoing development of the NFF, but also the participatory process itself offers spaces and moments for different actors to exchange and voice a wide range of perspectives on what is desirable for nature in the future. Moreover, this IPBES scenarios and models work also brought together a large modelling community for the first time to undertake a biodiversity and ecosystem services scenario-based model intercomparison (BES-SIM) for the IPBES Global Assessment (IPBES, 2019). The BES-SIM exercise strengthened ties between the biodiversity and climate communities by basing their input on the Shared Socio-economic Pathways and the Representative Concentration Pathways used for the climate scenarios in the IPCC (Rosa et al., 2020). The development of the NFF and the BES-SIM work thus not only adds to diversity of knowledge included in GEAs, but also offers opportunity for the empowerment of

Table 2

Overview of the three illustrative ideas, describing their place within different GEA phases.

	Mapping diverse perspectives, values and ontologies	Envisioning desired futures and pathways	Mini-publics
Scoping	Map breadth of different perspectives and problem framings of assessment subject	Develop a set of coherent visions of the future and pathways leading to them	Broaden range of perspectives asking questions
Production	Use mapping to include relevant knowledges, in assessment methods, and to keep diversity of frames	Structure the assessment using the visions and pathways	Reflection and deliberation from mini-public avoids closing down on issues that are contested
Use	Link the mapping to assessed solution-options	Provide actors with a shared ‘language’ for a political discussion on preferable courses of action	Set up regional/local mini-publics as citizen juries to translate findings towards recommendations to priorly specified actors

actors and their expertise by bringing together different stakeholders and different research communities.

5.3. Deliberative mini-publics

A further potential approach, and perhaps the most ambitious, is to set up deliberative mini-publics, consisting of randomly selected citizens from around the world (Setälä and Smith, 2018). These mini-publics would provide a deliberative process within GEAs to advise on the way different perspectives are reflected throughout the assessment's scoping, production and use phases. Most GEAs already allow anyone interested to submit review comments to their process, but this is a rather passive procedure, foremostly used by academics and specifically interested people. Instead, mini-publics could be a way to actively and purposefully bring in external perspectives, thereby avoiding prematurely closing down value-laden aspects of the assessment (cf. Kowarsch et al., 2017a). They have the potential to create space for various problem and solution frames and alternative forms of knowledge, facilitate deliberation and reflection, as well as to conduct more straightforward tasks like advising on communication strategies. At the same time, because they would not be a decision-making body within the GEA-process, the question of whether or not a majority opinion or consensus exists is irrelevant (cf. Bellamy et al., 2017): there is no need for mini-publics to achieve agreement, merely to force assessments to keep an open eye to different perspectives and positionalities. Implementing such an approach of global deliberation could usefully build on the experiences that will be gained from a current initiative for a global citizen assembly on the topic of genome editing, seeking to bring together at least 100 individuals from around the globe to deliberate on guiding principles for the regulation of genome editing (Dryzek et al., 2020).

6. Conclusion

In this paper we departed from highlighting how current efforts to improve the effectiveness of global environmental assessments reflect a growing sensitivity to the many different ways in which GEAs contribute to socio-environmental outcomes. We have argued this requires an understanding of GEA effectiveness that considers all elements that compose a GEA: i.e. not just their reports, but also their practices, processes and institutions, as well as the actors involved in these. Accordingly, we have put forward an approach to GEA effectiveness as depending on their ability to empower various kinds of actors. Acknowledging the polycentric and distributed character of contemporary environmental governance, GEA effectiveness therefore hinges on their ability to empower a broad range of actors in this landscape.

Furthermore, because organisational procedures as well as the problem and solution frames embedded in assessments provide more opportunity for some to be empowered than for others, GEAs have a political role as much as a scientific one. Hence, for GEAs to responsibly fulfil their empowering role requires them to adopt a reflexive attitude to their effectiveness and seek ways to include and accommodate a diverse range of actors, perspectives, and frames to enable broad empowerment. In our effort to provide constructive critique, we have provided three illustrative ideas in which this responsibility can be operationalised during the scoping, production and use phases of an assessment. Broadening empowerment in this way may have implications for the authority of assessments in traditional forums of environmental governance, but is in our view essential to reap the broader potential contribution of GEAs.

For science-policy scholars, the empowerment approach has implications for how GEAs are studied. Rather than just examining their internal workings or their uptake in formal decision-making settings, we urge a more open, grounded approach to empirically studying the multiple empowering effects that GEAs – as both products and processes – have in the world. We have provided a number of examples of how

such empowerment may play out in different GEA-phases, but greater insight is necessary into the myriad of places and ways GEAs are mobilised. In this way, a wider view of the effectiveness of GEAs can be developed (see also Borie et al., 2021).

Finally, more fundamentally, our argument also asks GEAs and their commissioning bodies to engage in an ongoing discussion on their purpose and power in contributing to socio-environmental outcomes, rather than merely decide on the specific questions a future assessment should answer. In the end, accommodating broad empowerment successfully depends on whether institutional structures can be changed accordingly. Concrete windows of opportunities for such discussions are approaching. For example, the IPCC's sixth Assessment Cycle ends in 2022, and early discussions on the 7th cycle have already started. The upcoming IPBES assessment reports may also benefit from the insights offered in this paper. In the long term, we think recurring GEAs would do well to regularly reflect on their purpose, position, and the degree to which these are matched by their procedures. Such reflection involves negotiating between different stakeholders' interest and preferences, without ever being able to fully satisfy them all. We realise this can be a thankless task, but nonetheless see it as an important one for GEAs to continue their empowering work responsibly.

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CRediT authorship contribution statement

Timo Y. Maas: Conceptualization, Writing - original draft. **Jasper Montana:** Conceptualization, Writing - review & editing. **Sandra van der Hel:** Conceptualization, Writing - review & editing. **Martin Kowarsch:** Conceptualization, Writing - review & editing. **Willemijn Tuinstra:** Writing - review & editing. **Machteld Schoonenberg:** Writing - review & editing. **Martin Mahony:** Writing - review & editing. **Paul L. Lucas:** Writing - review & editing. **Marcel Kok:** Writing - review & editing. **Jan Bakkes:** Writing - review & editing. **Esther Turnhout:** Conceptualization, Writing - review & editing.

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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