

Balancing authority and meaning in global environmental assessment: An analysis of organisational logics and modes in IPBES

Jasper Montana¹

1. School of Geography and the Environment, University of Oxford, South Parks Road, Oxford, OX1 3QY, UK.
jasper.montana@ouce.ox.ac.uk

Abstract

This paper interrogates the parallel goals of global environmental assessments (GEAs) to be both authoritative and meaningful sources of environmental expertise. It explores authority and meaning as distinct ‘organisational logics’ that guide the development of GEAs. Through the case of the Intergovernmental Science-Policy Platform on Biodiversity and Ecosystem Services (IPBES), the paper examines the organisation of expertise using an analytical framework of six organisational modes: the modes of foundation, incorporation, representation, convention, exhibition and transformation. Drawing on interviews and document analysis, the paper finds that the logic of authority and the logic of meaning often promote distinct organisational arrangements that are at times mutually reinforcing and at times in tension. The analysis suggests that balancing these two pursuits is not without its challenges. However, it highlights the potential to recognise GEAs as experimental and evolutionary organisations for environmental governance.

Keywords

Authority; Expertise; Global environmental assessments; IPBES; Meaning; Organisation

Highlights

- Authority and meaning are ‘logics’ that guide the organisation of expertise in GEAs
- The organisation of expertise in IPBES is perceived through ‘organisational modes’
- In IPBES, authority and meaning are at times mutually reinforcing or in tension
- Interactions between logics and modes can produce innovations in expertise
- Deeper thinking about organisational arrangements for transformation is needed

1. Introduction

Global Environmental Assessments (GEAs) have a forty year history as important sources of expert knowledge for environmental issues (Jabbour and Flachslund, 2017). The contributions that these GEAs make to environmental governance are manifold. GEAs provide synthesised accounts of environmental issues that help define the frames through which environmental issues are understood and guide the development of policy responses (Wyborn et al., 2018 ; Turnhout et al., 2016 ; Hulme, 2010 ; Rioussset et al., 2017 ; Jasanoff, 2010). Yet, they are also sites in which the contested organisational arrangements of environmental expertise can be negotiated and iteratively revised for a global audience (Miller, 2007 ; Beck et al., 2014 ; Hulme and Mahony, 2010). This is because the optimal way in which to produce expert knowledge that resonates both politically and culturally with a diverse audience across societies and scales remains deeply contested. In recent decades, intergovernmental organisations, such as the Intergovernmental Panel on Climate Change (IPCC) and the more recent Intergovernmental Science-Policy Platform on Biodiversity and Ecosystem Services (hereafter IPBES, or ‘the Platform’), have played a growing role in environmental assessment. While some have heralded these GEAs as a “gold standard” of environmental expertise (Reid and Mace, 2003), they are perhaps better understood as

experimental and evolutionary organisations whose design and operation are as much an emergent product of their work as the knowledge that they produce. These organisations involve a broad range of actors, from national governments to indigenous peoples. Given their complexity, there is a need to better understand the collective goals that hold GEAs together, and the ways in which diverse perspectives about these goals are negotiated.

In this paper, I contribute to understanding the organisational development of GEAs through an analysis of IPBES. Drawing on empirical research, I contend that the organisation of expertise in this GEA for biodiversity was driven by two major goals. First, the pursuit of authority – the capacity of the GEA to have impact and influence in international politics – and second, the pursuit of meaning, or the capacity of the GEA to construct a comprehensive, grounded and deliberative understanding of biodiversity. I understand these two goals as ‘logics’ – rationales that motivate a given activity – that are enacted through ‘modes’ – the particular way an activity is done (Barry et al., 2008). In IPBES, the activity in question is the organisation of expertise, which is enacted through the ongoing arrangements of people, practices, discourses and documents in the IPBES process. The analysis finds that the logics of authority and meaning can result in very different expectations for how expertise should be organised. But, synergies and innovations can also emerge.

In the sections that follow, I first introduce the case of IPBES and set out my methodological approach to examining organisation development in the early years of its operation. Next, I introduce the logics of authority and meaning as core justifications for the development of the Platform. This is followed by a description of six modes of organisation, including the modes of foundation, incorporation, representation, convention, exhibition and transformation. I deploy these as an analytic structure for considering the way in which the two logics have been enacted in organisational terms within the IPBES process. I conclude with a discussion of the insights and implications that can be drawn from this analysis. This analysis informs the future development of GEAs, such as that mooted for antimicrobial resistance (Woolhouse and Farrar, 2014), and contributes to unease about whether a one-size-fits-all approach to GEAs can adequately take account of the specific needs of different environmental issues (Pearce et al., 2018 ; Beck et al., 2014). The paper also foregrounds the role of authority and meaning in environmental governance, and challenges IPBES to consider its transformative potential in imagining and enacting these goals.

2. The Intergovernmental Science-Policy Platform on Biodiversity and Ecosystem Services (IPBES)

IPBES is a GEA for biodiversity established under the auspices of the United Nations in 2012 with the mandate to “strengthen the science-policy interface” for biodiversity (www.ipbes.net). The Platform emerged after a long period of formal and informal negotiations involving governments, scientific communities, and non-governmental stakeholders (see accounts of the Platform’s development in Arpin et al., 2016 ; Görg et al., 2010 ; Vadrot, 2014). Following an organisational model similar to the IPCC, IPBES adopted an intergovernmental structure and now has a membership of over 135 national governments that oversee its activities. During the first work programme of IPBES, which ran from December 2013 to April 2019, these member states requested and reviewed an ambitious set of thematic, methodological, regional and global assessment reports. Involving over 1,000 participating experts, IPBES has also sought to fulfil a

broader set of functions that have included the capacity building of participating science and policy communities, the development and promotion of policy support tools and approaches, and the catalysation of new knowledge generation.

As a contemporary expert body, the IPBES process is a prime case to analyse the organisational development of GEAs. Throughout its early operations, there have been continuing debates about how IPBES should be organised. These have ranged from high-level deliberations about the most appropriate structures, functions and processes for an expert body on biodiversity (Koetz et al., 2012), to detailed debates about conflict of interest and whether experts from commercial industries should be included in its expert groups (Larigauderie, 2015 ; Opgenoorth et al., 2014). Such debates are hallmarks of an organisation 'in the making' and valuable reference points from which to critically analyse the interplay of perspectives, values and strategic work that goes into creating expert institutions. IPBES has also grown up in the shadow of the IPCC, and the analysis and operation of IPBES cannot be removed from the lessons learnt from the experience of the climate change panel about the role that GEAs have in environmental governance (Pearce et al., 2018 ; Hulme and Mahony, 2010 ; Yamineva, 2017 ; Turnhout et al., 2016 ; Hulme, 2010 ; Beck et al., 2014). Indeed, IPBES has had to navigate the extent to which it should replicate the organisational approaches of the IPCC (Larigauderie and Mooney, 2010 ; Loreau et al., 2006), and where desirable, how it might diverge (Brooks et al., 2014 ; Beck et al., 2014 ; Hulme et al., 2011). There are two areas of notable divergence that actively contribute to the Platform's broad mandate of strengthening the science-policy interface. First, IPBES has made a stated commitment to build a more inclusive GEA than those that came before it (Díaz-Reviriego et al., 2019), and second, IPBES has adopted a broader set of functions that go beyond scientific assessment (Brooks et al., 2014). IPBES has also been remarkably more open to engaging with researchers through research interviews and observations within its work programme than some other GEAs, such as the IPCC. The dynamic and open nature of deliberations about the organisation of IPBES offered a rich empirical resource from which to understand the goals and mechanisms through which environmental expertise is made to matter at the global scale. By allowing analysts to observe this key phase of organisational development and actively engaging in a reflective process of review and revision, the Platform has good potential to evolve into the future.

The analysis in this paper is based on empirical research focusing on the organisational processes of IPBES during the development and implementation of its first work programme between the years 2013 and 2018. Data collection was carried out through qualitative methods, including interviews and document analysis. Semi-structured interviews were carried out with six administrators (A1-A6), derived from the Secretariat, Multidisciplinary Expert Panel and Bureau, and fourteen participating experts (E1-14) that were selectively sampled to focus on key actors in the process. Document analysis was carried out on the IPBES rules of procedure, IPBES press releases, editorial commentaries by IPBES participants and published articles about the IPBES process. The breadth of documents used was to take account of the fact that deliberations about the organisational development of IPBES have taken place both in its formal and informal structures, but also in other forums, such as the academic workshops and publications. The collected data was imported into qualitative analysis software (Atlas.ti) and analysed using a grounded theory approach (Charmaz, 2006) following a three-pass coding process. Institutional ethical approval was granted for this research by the University of Cambridge (23 July 2014).

In this paper, I deploy an analytical framework to examine the justifications for organisational development in IPBES that draws upon the concepts of ‘logics’ and ‘modes’ set out in Barry et al. (2008). Here, organisation refers to the work done to structure: the relations between participating experts; the practices that they enact; the language that they use; and the knowledge products that they produce. In other words, the work that IPBES does as an international expert process with frequent meetings, collectivised activities of deliberating and drafting assessment reports, and as an emblematic organisation for global expert knowledge. The development of these logics and modes as analytical categories to examine organisation in this paper followed an iterative process. First, empirical material was grouped according to similar arguments about the organisational development of IPBES. These accounts were then cross-referenced and revised in light of scholarly literature from science and technology studies, organisational studies, political science and elsewhere that considers different forms and effects of organisation as an activity. The logics in particular were developed in light of scholarship on GEAs in general, whereas the modes reflect a broader set of ideas on the development of epistemic and political authority and meaning in science and elsewhere. Relevant literature has been included in the text, although the cited works are illustrative and not comprehensive of the range of interpretations that could be extended to these logics and modes. The perspectives that are foregrounded in this paper focus largely on the small number of administrators and analysts of the Platform, rather than the many hundreds of scientists that serve it. The administrators were largely dominated by individuals with backgrounds in the natural sciences, whereas many of the external analysts writing on the IPBES process derive from social research backgrounds. While the view offered by these administrators and analysts is undoubtedly limited in scope, it reveals the deliberations and motivations at the heart of the IPBES process during its early years.

3. Organisational logics in IPBES

Logics has been defined as the “set of contemporary rationales about what the purposes of [a given activity] are and how it should be guided and justified” (Barry et al., 2008: 24). In the case of IPBES, the logics of organisation include the rationales about how the organisation of expertise should take place. Here, I use the concept of logics to analyse the proximate goals of IPBES – “to strengthen the science-policy interface” – rather than the more distal goals of “the conservation and sustainable use of biodiversity, long-term human well-being and sustainable development” (IPBES, 2012). I contend that an empirically-informed reading of these proximate goals draws attention to parallel desires to create expertise that is both authoritative and meaningful at the global scale. This reading derives from both empirical observations and scholarly literature on the presumed functions of GEAs in environmental governance (set out below). It also draws on scholarship in STS that has argued that understanding the design and operation of expert bodies necessitates a recognition of both the political and epistemic nature of these organisations, and that these features are also frequently entangled (Jasanoff, 2005 ; Jasanoff, 2004). The logics of authority and meaning are therefore developed here as analytical categories to interpret the justifications for organisational activities in IPBES. These logics are neither exhaustive nor definitive (following Barry et al., 2008), and alternative logics could be described, such as a logic of ‘truth’ in which expertise is organised to obtain a more absolute and unbiased account of reality, or a logic of ‘humility’ in which expertise is organised to emphasise substance, process and deliberation, as well as analysis (Jasanoff, 2003). However, the logics of authority and meaning stand out as being compelling analytical categories for their ability to illuminate the arguments made by interviewees and analysts about why and how IPBES should develop as an expert

organisation, and the insights that can be drawn from the scholarly literature on organisation more generally on the way that authority and meaning can be enacted in organisational terms (set out in more detail in Section 3.). I turn now to more clearly articulate what each of these logics of authority and meaning entails.

The logic of authority can be summed up by considering the reflection of one of the IPBES administrators who explained the reason for why IPBES was necessary, by stating:

“We support all of this – I shouldn’t say – grief. All of this additional cost, right? Intergovernmentality comes at a very high price. Literally! High transaction costs. Then the whole purpose of it is to have an impact. Otherwise we can go back and produce scientific reports, and we know how to do that, but we also know that it doesn’t work all that well.” (Administrator A Interview, January 2015)

The logic of authority was identified from statements such as this, where interviewees and documents referred to the organisational development of IPBES as primarily being directed towards having an impact, influencing politics or wielding power in various ways. This follows a longstanding preoccupation of scholars, who have sought to understand how, when and why GEAs are able to attain impact and influence. In doing so, scholars have largely engaged with the authority of GEAs through both normative and analytical scholarship on their procedural standing and perceived effectiveness (Farrell et al., 2001 ; Cash et al., 2003 ; Haas, 2017 ; Esguerra et al., 2017), or through examinations of the notional impact and influence of their work (Mitchell et al., 2006 ; Rioussset et al., 2017 ; Biermann, 2002). In many cases, the pursuit and analysis of impact and influence in GEAs has become tied to discussions of the attributes of their knowledge production, in the form of the triptych: credibility, legitimacy and salience (Cash et al., 2003). So, the argument goes, the potential of knowledge to influence societal responses to environmental issues is linked to the extent to which it is considered credible (believable and trusted information), legitimate (derived from a fair process that considers appropriate values, concerns, and perspectives of different actors), and salient (that the information is relevant to the needs of publics or decision-making bodies). These attributes of influential knowledge production have been rapidly adopted as useful design principles by advocates, designers and analysts of GEAs, including the Millennium Ecosystem Assessment (Reid and Mace, 2003: 943), the IPCC (Sarkki et al., 2014) and later IPBES (Koetz et al., 2012). These principles are sometimes treated as largely stable targets with characteristics that can be optimised, traded off or evaluated against policy maker concerns (i.e. Dunn and Laing, 2017; Sarkki et al., 2014, 2015). They are also recognised as contested terms around which to negotiate priorities in the organisation of GEAs (Koetz et al., 2012; Hulme and Mahony, 2010). In IPBES, credibility, legitimacy and relevance have been included in the operating principles of the Platform, and are in common usage during deliberations on the operations of the Platform. However, I argue that this interpretation of authority is also limiting. Tying our understanding of authority to what might be considered ‘perverse analytic mantras’ (Jasanoff, 2013: 444) limits the scope through which authority can be imagined, resulting in the concentration of power amongst those that claim technical expertise over their interpretation. Indeed, recent scholarship has moved away from these principles, and instead sought to engage with authority as a relational property between the producers and users of expert knowledge that operates within a particular jurisdiction and is open to negotiation and development (i.e. Gustafsson and Lidskog, 2018 ; Porter et al., 2018 ; Hughes and Vadrot, 2019). The understanding of authority in this paper takes a similar approach, recognising authority as an

organisational achievement that is ultimately enacted and negotiated through the ongoing arrangement of and relations between discourses, people, practices and documents in GEAs. Looking at authority in organisational terms is yet another way in which to explore how authority is being imagined and performed in GEAs.

If the logic of authority is found in statements about impact and influence, then the logic of meaning can be detected in statements about the need for understanding, taking account of complexity, promoting deliberation between different perspectives, and being sensitive to local needs and conditions. This position is illustrated by considering another reflection from the administrator quoted above on the need for IPBES to include more than just biological sciences in its work.

“You don’t speak directly to fish in the ocean. You need laws. You need regulations. You need many different things that people do that are between you and the fish, and that affect the fate of that fish, and so that’s what we were trying to accomplish: to involve all of the range of scientific disciplines that need to be examined, screened, all of the different knowledges so that we have the full picture, including science based solutions.”

(Administrator A Interview, January 2015)

The concept of meaning is less explicitly acknowledged in literature on GEAs, although it is an underlying theme of much critical social science scholarship about them. One of the more explicit accounts of the tensions around meaning in GEAs considered the IPCC’s tendency to create scientific facts that “arise out of detached observation” at the cost of meaning that “emerges from embedded experience.” (Jasanoff, 2010: 234-235) The argument follows that the production of scientific representations in the IPCC, such as long-term trends in global average temperature, results in abstract knowledge that “cuts against the grain of ordinary human experience, the basis for our social arrangements and ethical instincts” (Jasanoff, 2010: 237). Considering this analysis raises the important question: who should GEAs be meaningful to? Facts produced by detached global observations may be highly meaningful to the scientists that produce them. In these terms, meaning always and inevitably is pursued by GEAs, but the organisation of expertise has largely prioritised a version of meaning that resonates with those within them. Yet, scholars have argued that GEAs also need to recognise that: “their importance to global society is not so much in just getting the facts right”, which may be most meaningful to many of the participating experts, and instead embrace their role “in expanding the opportunities for global society to deliberate and debate the epistemic frameworks underlying policy choices made for the world as a whole.” (Miller, 2007: 352) In this sense, a fuller understanding of meaning in GEAs takes account of their role in fostering deliberative and open understanding of environmental issues while taking account of complexity of the global scale and being sensitive to local needs and conditions. This reflects what some have called a ‘cosmopolitan approach’ to environmental expertise (Hulme, 2010) that offers “a more differentiated, reflexive, and more culturally sensitive approach to scientific expertise in the more complex, contingent, contested, and ‘nested’ settings of global politics.” (Beck, 2012) The pursuit of meaning can therefore be recognised in a range of justifications for organisational development in GEAs, such as broadening participation (Díaz-Reviriego et al., 2019 ; Kowarsch et al., 2017a ; Ford et al., 2012 ; Ho-Lem et al., 2011), enhancing the integration of different ways of knowing (Tengö et al., 2017 ; Turnhout et al., 2012 ; Jetzkowitz et al., 2018 ; Löfmarck and Lidskog, 2017), providing context-based solutions (Haas, 2017 ; De Pryck and Wanneau, 2017 ; Minx et al., 2017) and supporting societal transformations (Kowarsch

et al., 2017b ; Jasanoff, 2010). In IPBES, the logic of meaning is also embedded in its operating principles which recognise the unique knowledge of different world regions, the contributions of indigenous and local knowledge, and the need to include all relevant disciplines in its work (IPBES, 2012). However, as with authority, there remains potential for alternative ways to understand meaning in IPBES as it plays out in organisational terms through the development of the Platform. In particular, there is value in recognising where the logics of authority and meaning are mutually supporting, where they create tensions, and where they facilitate new organisational emergences or innovations in environmental expertise. To further explore what the logics of authority and meaning have meant in practice to the organisational development of IPBES, I turn now to reflect on the modes through which IPBES enacts its organisation.

4. Organisational modes in IPBES

In this paper, organisational modes are used to consider the way in which organisation is actually put into practice in IPBES. As with the two logics, these ‘modes’ (Barry et al., 2008) are analytical categories derived from empirical observations of IPBES and reading of the scholarly literature on organisation, broadly construed, that help interpret the organisational development of the Platform. In this paper, I describe six organisational modes: namely, the modes of foundation, incorporation, representation, convention, exhibition and transformation. These modes reflect the distinct ways in which interviewees and documents understood and enacted authority and meaning in organisational terms. While these organisational modes may resonate with other organisational settings, they are not intended to be understood as inherent aspects that are desirable or undesirable in any organisation. Rather, they are a set of ways of working that were identified as analytically useful for understanding the IPBES process. These organisational modes partially align with other ways of thinking about organisations, such as the functions, structures, processes, outputs and outcomes previously noted in GEAs (Sarkki et al., 2015). However, rather than emphasising the static features of this organisation, the lens adopted in this paper seeks to emphasise a process-based view of organisation-in-action as always in the making (Hernes, 2007). I introduce these modes as a way to trace the negotiation and enactment of the logics of authority and meaning in the early years of the IPBES process (Table 1.), which I set out as follows.

Table 1. The six organisational modes and examples of their enactment according to the logics of authority and meaning in IPBES

Organisational mode	Examples of enactment according to logic of authority in IPBES	Examples of enactment according to logic of meaning in IPBES
Foundation	The promotion of a discourse about IPBES as a mechanism for impact and influence.	The promotion of a discourse about IPBES as a mechanism for enhancing the breadth and diversity of ways to understand and value biodiversity
Incorporation	The frequent establishment of unified and bounded bodies of expertise – be they the plenary, expert groups or reports.	The emphasis on embodiment by placing the locus of expertise in localised and distributed networks.
Representation	The promotion of inclusion as a means to gain legitimacy amongst diverse audiences.	The promotion of inclusion as a means to gain a more comprehensive understanding of biodiversity and take account of local variability.

Convention	The formalisation and standardisation of approaches.	The institutionalisation of reflexivity to allow iterative evaluation and revision of approaches.
Exhibition	The production of spectacle around assessment reports and external evaluation activities.	The contextualisation of assessment reports through local dialogue workshops and open peer review processes.
Transformation	The empowerment of IPBES as an agent of transformative change	The transformation of IPBES as part of the process of transformative change

4.1 The mode of foundation

The first of these organisational modes is the **mode of foundation**, which relates to the organisational work done in defining and promoting a need or gap, and thereby laying the foundation for new organisational emergences. For IPBES, the mode of foundation is well illustrated by examining the discourses that were promoted around the establishment of the Platform. These arguments were mostly made either at scientific meetings or in editorials in high-profile publications. As one of the senior IPBES administrators involved at the time noted: “the role of these editorials was to enlarge the effort [around the establishment of IPBES]. To really bring in more troops into the discussion and also to support it. [...] So that the community at large would own this idea and defend it. That was the goal.” (Administrator A Interview, January 2015) As this quote suggests, the mode of foundation works through building coalitions, developing shared ideas of a problem, and shared language through which to understand the need for a new organisational emergence (recognising, Hajer, 1997). This also aligns with insights from innovation studies, which have noted that the development of new technologies is often co-produced with a consumer community that has a shared understanding of the problem that it is intended to solve (Akrich et al., 2002 ; Callon, 1987 ; Pinch and Bijker, 1994 (1989): 30). For those subscribed to a logic of authority, foundation for IPBES centred on a need to strengthen the authority of biodiversity science. As a prominent comment piece in the journal *Nature* noted:

“There is [...] clear scientific evidence that we are on the verge of a major biodiversity crisis. [...] Despite this evidence, biodiversity is still consistently undervalued and given inadequate weight in both private and public decisions. There is an urgent need to bridge the gap between science and policy by creating an international body of biodiversity experts.” (Loreau et al., 2006: 245)

According to this account, the priority for IPBES was not to produce new kinds of knowledge, but rather to help replicate the “strongly organized scientific community” of climate change (Loreau et al., 2006: 245). For those pushing a logic of meaning, on the other hand, the establishment of IPBES provided an opportunity to develop a more contextual and diverse understanding of biodiversity. As another comment piece in the journal *Nature* argued: “We ask that the IPBES respect the manifold meanings biodiversity has for people. Monetary, aesthetic and sacred values should be given equal prominence in policy discussions of what biodiversity and ecosystems offer to humans, for example.” (Turnhout et al., 2012: 455) Here, the argument was for IPBES to “listen to the voices of experience”, suggesting that any organised scientific community for biodiversity developed through IPBES “must draw on a much broader range of knowledge and stakeholders than the IPCC” (Turnhout et al., 2012: 454). These editorials, combined with scientific meetings and intergovernmental negotiations, contributed the discursive construction of the idea of IPBES

in preparation for it to mobilise the financial and human resources necessary for the Platform to emerge in organisational form.

4.2 The mode of incorporation

The second mode, that of incorporation, relates to the organisational work done in arranging bodies (of experts and knowledge) in relation to each other. For IPBES, the mode of incorporation is reflected in its formal establishment as an independent and intergovernmental body, but incorporation also plays out in the form of its expert groups, in the production of its assessment reports, and even in the development of its network of stakeholders. In IPBES, the logic of authority can be seen working through the mode of incorporation in arguments and actions suggesting that impact and influence comes from collectivisation and unification. As one of the participating experts explained: “these large initiatives [like IPBES] they have that sort of weight, they have that mandate, which a lot of individual projects and individual studies just don’t have.” (Expert A Interview, January 2015) A similar logic applied when the IPBES Executive Secretary, Anne Larigauderie, commented after the approval of the IPBES Global Assessment: “the scientific community is speaking with one voice, [...n]ow it’s not something that can be ignored.” (quoted in Stokstad, 2019) The assertion that bringing bodies together can be a source of power follows social theory that has shown that incorporation has long been seen as a route to authority: Thomas Hobbes described the making of sovereign power in the 17th century achieved by joining citizens together by social contract into a Commonwealth (Hobbes, 1651); subsequent scholars have noted the power attained from forging alliances within actor-networks (Latour, 1983 ; Latour and Callon, 1981); and trade unions and grassroots movements follow the dictum that working together can get things done (Kahn, 1993: 5). However, while the centralised and collective power of IPBES was a major attraction for some experts to increase the impact of biodiversity science, for others it was a potential weakness. Indeed, for some analysts of IPBES, the Platform would be best served by operating: “not as a centralised global organisation, but as a global coordinator of a distributed network [of expertise] that can be sensitive to local knowledge, needs and conditions.” (Turnhout et al., 2012:455). This argument can instead be seen to follow a logic of meaning, which pushes back against a tendency for GEAs to produce disembodied ‘views from everywhere’ in the form of ‘global kinds of knowledge’ (Hulme, 2010). This approach to incorporation is perhaps best informed by feminist scholars in science and technology studies that have identified a need to recognise the body as the place in which all knowledge and meaning are made (Haraway, 1988). The argument follows that taking account of the diversity of meaning presented by different bodies requires: “the view from a body, always a complex, contradictory, structuring and structured body, versus the view from above, from nowhere, from simplicity.” (Haraway, 1988: 195) Scholars have therefore called for IPBES to foster a ‘nested network’ that can “provide a responsive and flexible ‘nervous system’ to gather, synthesise and distribute knowledge for the Plenary of the IPBES” (UFZ, 2011: 1). The establishment of stakeholder networks, regional hubs, and national focal points hint at the enactment of a broader logic of meaning within the IPBES process. However, the establishment of IPBES partially modelling on the IPCC and its intergovernmental structure has limited the extent to which alternative organisational arrangements could be brought into being. The centralised structures of IPBES (the intergovernmental Plenary, the secretariat, the central administrative and technical bodies) and their largely consensus-based approach to decision-making remain prominent.

4.3 The mode of representation

Next, the mode of representation relates to the organisational work done in creating systems of substitution where parts of an organisation are made to stand in for or represent other things. For IPBES, representation played out largely in the inclusion of selected experts that implicitly – if not explicitly – represented a wider diversity of people and perspectives from outside the Platform. In particular, representation was found in the intergovernmental meetings, where national governments were represented by small delegations. Representation was also present in the different author groups, where experts were selected with regards to their professional, national, and gender identities. Representation as an organisational practice is familiar in democratic systems of government, in which elected representatives are authorised to stand in for and make decisions on behalf of others in a parliamentary setting. Scholarship in science and technology studies has suggested that these systems of representation work by simplifying the world's complexity and allowing synoptic perspectives to be obtained (Latour, 1990), but in doing so, they also obscure local diversity of perspectives and meanings that also matter in responding to societal issues (Scott, 1998). In IPBES, the logic of authority supported representation because it offered a way in which to amass the representative power of diverse knowledge and policy communities. Reflecting on why the Platform needed to be so inclusive of experts from different world regions, one of the administrators reflected: "If you don't involve all of the parts of the world, then are you going to have the same impact? That's the big question!" (Administrator A Interview, January 2015). Similarly, explaining why it mattered that IPBES was the first biodiversity assessment to have an intergovernmental structure, another administrator explained: "you need an intergovernmental structure for it to carry enough weight in the intergovernmental community" (Administrator B Interview, April 2015). In these terms, representation equalled influence, but representation is also aligned with the pursuit of meaningful expertise. Indeed, representation allows a wide diversity of knowledge of things (be it biodiversity, local customs or otherwise) to be brought into IPBES and therefore be acknowledged within its work. Contributing to the logic of meaning, representation of diverse participants in IPBES was justified and promoted as a means to access relevant information from different parts of the world and thereby better understand local differences. As one administrator noted, representation: "is also I think important for the ownership and the relevance of the findings, so that [a report] is better anchored in the region at the lower level than the global." (Administrator C Interview, May 2015) Representation also contributes to meaning in GEAs by simply allowing the deliberation of diverse perspectives (Miller, 2007). The logic of authority and the logic of meaning are therefore mutually reinforcing for the mode of representation, and this has made the intent of inclusivity in IPBES a major strength of the Platform (Díaz-Reviriego et al., 2019).

4.4 The mode of convention

The mode of convention relates to the organisational work done in establishing the norms and traditions through which action takes place. The mode of convention was enacted in IPBES through explicit efforts to develop the Platform's processes and traditions, which are set out in the Rules of Procedure, or otherwise emerge as ritualised activities and routines. Such rules and social norms have long been recognised as significant to the authority of the scientific enterprise in general (Shapin and Schaffer, 1985), and more specifically for the design and operation of expert institutions in national settings (Jasanoff, 2005: 267). For the logic of authority, convention tended towards the formalisation and standardisation of procedures within IPBES. At the heart of this was the intergovernmental process, which one administrator described as "a very authoritative or

highly legitimised process, with a big strong emphasis on visibility and legitimacy” (Administrator D Interview, June 2015). Another administrator added:

“the scientific community [...] was aware that science alone - business as usual - was not powerful enough to convey the messages that they wanted to convey. So they thought [...] through science being requested by policy makers and delivered with this very specific timeframe and guidelines, and all of this kind of heavy stuff, there was the hope that their [biodiversity] science could have more of an impact [on policy], and ultimately [also] on the fate of biodiversity.” (Administrator A Interview, January 2015)

The ‘heavy stuff’ of the intergovernmental process gave weight to the work of IPBES. However, alongside this, some experts and administrators saw the mode of convention as an opportunity to standardise biodiversity research by using IPBES to overcome “a lot of confusion in decision making in many countries” due to a lack of consistency in how biodiversity was being treated in science and policy settings (Administrator E Interview, February 2015). One administrator argued: “to bring all of those concepts a little bit together and make it a kind of uniform, or not a uniform, but unified approach and concept is a very good thing that IPBES is trying to do.” (Administrator E Interview, February 2015). Meanwhile, critical analysts cautioned against the standardisation of approaches within IPBES. Some analysts wrote that while the Platform had acknowledged the multiplicity of knowledge systems in its conceptual framework: “What is essentially at stake is whether the IPBES can employ mechanisms of standardization and commensuration while at the same time retaining uncertainties, divergent world views, and relevant local and indigenous knowledge” (Beck et al., 2014: 84). Fostering a logic in which meaning emerges through deliberation of diverse perspectives, these analysts argued that GEAs need to adopt reflexivity as a convention in which they “continuously review [their] own procedures, performance, and underlying assumptions.” (Beck et al., 2014: 82) In a similar vein, other scholars called for a convention of ‘iterativity’, characterised by “building on previous practices, learning from success and failure, and fostering evolution of constructive relationships and knowledge itself” (Sarkki et al., 2015). Despite these calls to continuously adapt the organisation of expertise, the early alignment between IPBES and the intergovernmental model of the IPCC has thus far foregrounded the logic of authority in the enactment of convention.

4.5 The mode of exhibition.

The mode of exhibition relates to the organisational work done in drawing together an attentive audience to collectively witness and scrutinise activities. The mode of exhibition in which audiences are organised to witness the production of scientific facts can be traced back to the early days of the experimental sciences (Shapin and Schaffer, 1985). The mode of exhibition is also tied to the public scrutiny, which is enacted often today in the form of transparency and accountability (Strathern, 2000). For IPBES, the mode of exhibition can be seen in its explicit effort to publicly perform expertise to an international audience. Following a logic of authority, exhibition results in the theatrics of formality in the annual Plenary meeting (also noted in Hughes and Vadrot, 2019) and the spectacle of press conferences held around the approval of its assessment reports. Reflecting on this, one administrator noted: “you need a high-level visibility and noise around [the assessments]. And that is what this platform definitely does give, disregarding the substance.” (Administrator D Interview, June 2015) In this account, authority comes through the production of ‘noise’ in the international media that has the potential to

increase the impact and influence of the Platform's work. For the logic of authority, exhibition also plays out in the performance of transparency and accountability in the shape of the external evaluation focusing on the effectiveness of IPBES published in 2019. The logic of meaning, by contrast, is more likely to be detected in the work of stakeholder communities that have sought to recontextualise the work of IPBES through activities, such as an interactive "walking workshop" that was organised in the Karen forest and rotational farming landscapes of Thailand, where insights from the IPBES assessment on pollinators and pollination were brought into dialogue with local experiences, practices and policy needs (Malmer et al., 2019). Similarly, scrutiny that directly contributes to the meaningfulness of the Platform's work is fostered in the open peer-review process in which drafts of each assessment report are made available at least three times during their production in order for external communities to read and comment. For some critical scholars, the "spectacle of assessments competing against one another for supremacy" can be a limitation of GEAs (Beck, 2011: 303). However, more meaning-oriented approaches to exhibition take time and, aside from peer-review processes, they are yet to be well rehearsed by GEAs.

4.6 The mode of transformation

The sixth and final mode of transformation relates to the work of acting beyond the boundaries of the organisation to bring about wider change. For IPBES, the mode of transformation was highlighted by a small number of interviewees and analysts who expressed a direct desire for IPBES to catalyse change beyond the proximate goal of strengthening the science-policy interface. As one expert reflected: "Unless, there is some real outcome for biodiversity and ecosystem services that would not have occurred otherwise then the whole thing has been a waste of time." (Expert B Interview, June 2015) The distinction between the logics of authority and meaning are difficult to discern for the mode of transformation because the transformative potential of IPBES was not widely discussed in its early years of operation. I tentatively posit that the two logics are actually present in the distinct approaches that were discussed about the non-assessment functions of IPBES, namely capacity building, knowledge generation, and policy support. Some actors in the IPBES process saw the non-assessment functions as important primarily as a way to strengthen the assessment function of IPBES. As one of the administrators explained: "my own interpretation of it is that IPBES will build capacity to the extent that it helps doing the assessments. [...] The other functions, they are there to really strengthen the assessment function." (Administrator A, 2015) For others, the non-assessment functions of IPBES were not solely to create external change that could further empower IPBES, but rather as a way of facilitating wider positive change for its own sake. For example, one of the participating experts from an early IPBES deliverable on policy support tools explained that:

"I think [the Plenary] just saw [our deliverable on policy support tools and methodologies] as a list of policy tools, and that was that. Whereas I think in the group, [...] we saw it very much as this incredibly interactive process, where there would be continuous feedback to add new tools, to evaluate the effectiveness of different tools in different contexts, and also we saw it very much as a networking opportunity for people working on similar issues in similar contexts to come together and learn from each other". (Expert A Interview, January 2015)

Drawing on these two reflections, it appears that a distinction could be drawn for the mode of transformation. On one hand, a logic of authority focuses on the empowerment of IPBES as an

agent of transformative change, and on the other, a logic of meaning focuses on the transformation of IPBES (its participants and those it interacts with) as an integral part of the process of transformative change. This first view of transformation centred on authority ultimately assumes IPBES remains the locus of power. The second view of transformation centred on meaning instead sees IPBES as an object and agent of change in itself. This requires a partial reimagination of the role of GEAs, from simply being producers of knowledge, to making themselves open to transformation as participants in the processes of coming together and learning from each other. This emphasis on learning and adapting, and the co-emergence of new forms of knowledge alongside new social arrangements aligns with literature on the co-production of sustainability (Miller and Wyborn, 2018 ; Jasanoff, 2004) and points to the need for deeper thinking about the kinds of organisational arrangements that might support the mode of transformation in GEAs.

5. Discussion

The analysis shows that despite a shared commitment to the potential of GEAs to strengthen environmental governance, disagreements remain about their organisational development. I suggest that recognising the interplay between a logic of authority and a logic of meaning can be useful to understand this politics of organisation, and I propose six organisational modes as a way in which to explore these differences. Consistent with previous scholarship on logics of knowledge production (Barry et al., 2008 ; van der Hel, 2016), the findings of this paper suggest that the logics of authority and meaning are at times in tension, and at other times mutually reinforcing. For the mode of representation, both authority and meaning were recognised as supported by creating more diverse expert groups. But for other modes, such as that of incorporation, fundamental differences between tendencies to centralise or distribute expertise still persist.

The case of IPBES suggests that these tensions between authority and meaning can also be generative of innovations in environmental expertise. The Nature's Contributions to People approach that emerged from IPBES deliberations and provides a way of acknowledge both "generalising" and "context-specific" perspectives in human and environment relations (Diaz et al., 2018) can be seen as a pertinent example. This approach follows a mode of convention – in that it offers a procedural framework for synthesis in the IPBES process – and it responds to recognised tensions tied to the modes of representation and incorporation, in which diverse experts have been brought together to reach a consensus position on the conduct of assessment. The potential of similar tensions between divergent viewpoints on environmental issues has been previously noted to bring about novel forms of environmental knowledge within GEAs (Borie and Hulme, 2015 ; Montana, 2017 ; Kowarsch et al., 2017a). Despite often publicised beliefs that debates within GEAs are a threat to their authority (i.e. Masood, 2018: 423), some critical scholars have argued that GEAs should more explicitly "confront the reality of uncertainties, political antagonisms, and power struggles in order to render them open to change, rather than simply ignoring them." (Beck et al., 2014: 85) Taking account of the tensions that arise around balancing logics of authority and meaning in GEAs may be a prime place to start. The assessment on Transformative Change planned for the IPBES work programme up to 2030 may be an opportunity to further explore authority and meaning in IPBES, but also in environmental governance more generally. Indeed, the tensions identified in IPBES are also found in other research settings, such as debates about unity and difference in the field of conservation science (Tallis and Lubchenco,

2014 ; Matulis and Moyer, 2017). Taking these tensions as potential sites for further enquiry may be beneficial to the future development of environmental knowledge production.

Although this paper focuses on IPBES as its central case study, the study of IPBES can inform broader issues in environmental governance. Certainly, other GEAs, such as the IPCC, have informed the development of IPBES and therefore have many features in common. Further comparative analysis about how the IPCC and IPBES have balanced authority and meaning in different ways could be beneficial. This may help explain the prioritisation of different organisational arrangements in the two organisations, but also inform a broader understanding of how climate and biodiversity differ as environmental issues. This would also be beneficial to future attempts to adopt an intergovernmental structure for expertise on other issues, such as antimicrobial resistance (Woolhouse and Farrar, 2014). The full extent to which these organisational modes are useful to thinking about other kinds of organisation would require further research. The modes could, for example, be applied to trace the contours of a funded research project: from the grant application (mode of foundation) to the publication of results (mode of exhibition). They may even offer insights on the organisation of societal responses to environmental issues more generally, where differences in meaning and sources of authority are also in tension.

The concepts of authority and meaning are deployed in this paper, because these concepts have an operational usage in scholarship on environmental governance (Hulme, 2010 ; Jasanoff, 2010). However, it is significant to note that these concepts are also social constructs: they are not universal conditions that can be explicitly designed into a GEA or any other organisation, but are instead co-produced outcomes of conflict and closure. Indeed, their perception is continually evolving as they are performed and described by diverse actors in environmental governance (Turnhout et al., 2016), and they are also likely to be co-dependent (Porter et al., 2018: 875). The definition and enactment of authority and meaning can thereby be seen as choices that are made by administrators, experts and analysts of GEAs. Arguing for and determining the implementation of credibility, legitimacy and salience as desirable attributes in GEAs is not a neutral act of putting in place pre-defined organisational structures, but rather administrators and experts are acting as the co-authors of what authoritative and meaningful expertise can and should look like at the global scale. The production of environmental expertise has been recognised to carry with it “beliefs and values about the world it is seeking to describe” (Mahony and Hulme, 2018: 16), however this analysis suggests that environmental expertise also carries beliefs and values about the design and function of expertise in environmental governance. Arguably, there are therefore moral and ethical implications of making GEAs, which can be seen not as a burden for GEAs, but rather as part of their mandate to provide the spaces in which global society can deliberate the epistemic frameworks that underpin environmental governance (Miller, 2007). This is no easy task and there are no straightforward answers. Given the complexity of environmental issues and the societies to whom they matter, this is likely to require the development of organisational approaches that negotiate between multiple forms of meaning as well as multiple forms of authority. Doing so will be made easier by accepting that GEAs are experimental and evolutionary organisations whose design and operation are as much an emergent product of their work as the knowledge that they produce.

Acknowledgements

Data collection for this work was supported by the Economic and Social Research Council [grant number 1362673]. Data analysis and writing was supported by an Early Career Fellowship from the Leverhulme Trust. The author would like to thank the interviewees for their contributions, and Bill Adams, Rachel Fensham and Jamie Lorimer for comments on earlier drafts of this manuscript.

Biography

Jasper Montana is a Research Fellow at the School of Geography and the Environment at the University of Oxford. He is funded by an Early Career Fellowship from the Leverhulme Trust. His work focuses on the human values associated with organisational dynamics of environmental governance.

References

- Akrich M, Callon M and Latour B. (2002) The key to success in innovation. Part II: The art of choosing good spokespersons. *International Journal of Innovation Management* 6(2): 207-225.
- Arpin I, Barbier M, Ollivier G, et al. (2016) Institutional entrepreneurship and techniques of inclusiveness in the creation of the Intergovernmental Platform on Biodiversity and Ecosystem Services. *Ecology and Society* 21(4): 11. DOI:10.5751/Es-08644-210411
- Barry A, Born G and Weszkalnys G. (2008) Logics of interdisciplinarity. *Economy and Society* 37(1): 20-49. DOI:10.1080/03085140701760841
- Beck S. (2011) Moving beyond the linear model of expertise? IPCC and the test of adaptation. *Regional Environmental Change* 11(2): 306. DOI:10.1007/s10113-010-0136-2
- Beck S. (2012) The challenges of building cosmopolitan climate expertise: The case of Germany. *Wiley Interdisciplinary Reviews: Climate Change* 3(1): 1-17. DOI:10.1002/wcc.151
- Beck S, Borie M, Chilvers J, et al. (2014) Towards a Reflexive Turn in the Governance of Global Environmental Expertise The Cases of the IPCC and the IPBES. *Gaia-Ecological Perspectives for Science and Society* 23(2): 80-87. DOI:10.14512/gaia.23.2.4
- Biermann F. (2002) Institutions for scientific advice: Global environmental assessments and their influence in developing countries. *Global Governance* 8(2): 195-219. DOI:10.1163/19426720-00802007
- Borie M and Hulme M. (2015) Framing global biodiversity: IPBES between mother earth and ecosystem services. *Environmental Science & Policy* 54: 487-496. DOI:10.1016/j.envsci.2015.05.009
- Brooks TM, Lamoreux JF and Soberon J. (2014) IPBES not equal IPCC. *Trends Ecol Evol* 29(10): 543-545. DOI:10.1016/j.tree.2014.08.004
- Callon M. (1987) Society in the Making: The study of technology as a tool for sociological analysis. In: Bijker WE, Hughes TP and Pinch TJ (eds) *The Social Construction of Technological Systems: New directions in the sociology and history of technology*. Cambridge, Massachusetts: MIT Press, 83-103.
- Cash DW, Clark WC, Alcock F, et al. (2003) Knowledge systems for sustainable development. *Proc Natl Acad Sci U S A* 100(14): 8086-8091. DOI:10.1073/pnas.1231332100
- Charmaz K. (2006) *Constructing Grounded Theory: A practical guide through qualitative analysis*, London: Sage.
- De Pryck K and Wanneau K. (2017) (Anti)-boundary work in global environmental change research and assessment. *Environmental Science & Policy* 77: 203-210. DOI:10.1016/j.envsci.2017.03.012
- Díaz S, Pascual U, Stenseke M, et al. (2018) Assessing nature's contributions to people. *Science* 359(6373): 270-272. DOI:10.1126/science.aap8826
- Díaz-Reviriego I, Turnhout E and Beck S. (2019) Participation and inclusiveness in the Intergovernmental Science-Policy Platform on Biodiversity and Ecosystem Services. *Nature Sustainability* 2(6): 457-464. DOI:10.1038/s41893-019-0290-6
- Dunn G and Laing M. (2017) Policy-makers perspectives on credibility, relevance and legitimacy (CRELE). *Environmental Science & Policy* 76: 146-152. DOI:10.1016/j.envsci.2017.07.005

- Montana, J. (2020) Balancing authority and meaning in global environmental assessment: An analysis of organisational logics and modes in IPBES. *Environmental Science and Policy*. 112: 245-253. <https://doi.org/10.1016/j.envsci.2020.06.017>
- Esguerra A, Beck S and Lidskog R. (2017) Stakeholder Engagement in the Making: IPBES Legitimization Politics. *Global Environmental Politics* 17(1): 59-76. DOI:10.1162/GLEP_a_00390
- Farrell A, VanDeveer SD and Jäger J. (2001) Environmental assessments: four under-appreciated elements of design. *Global Environmental Change* 11(4): 311-333. DOI:10.1016/S0959-3780(01)00009-7
- Ford JD, Vanderbilt W and Berrang-Ford L. (2012) Authorship in IPCC AR5 and its implications for content: climate change and Indigenous populations in WGII. *Clim Change* 113(2): 201-213. DOI:10.1007/s10584-011-0350-z
- Görg C, Neßhöver C and Paulsch A. (2010) A new link between biodiversity science and policy. *Gaia* 19(3): 183-186.
- Gustafsson KM and Lidskog R. (2018) Organizing international experts: IPBES's efforts to gain epistemic authority. *Environmental Sociology* 4(4): 445-456. DOI:10.1080/23251042.2018.1463488
- Haas PM. (2017) The epistemic authority of solution-oriented global environmental assessments. *Environmental Science & Policy* 77: 221-224. DOI:10.1016/j.envsci.2017.03.013
- Hajer MA. (1997) *The Politics of Environmental Discourse: Ecological modernization and the policy process*, Oxford: Oxford University Press.
- Haraway D. (1988) Situated knowledges: The science question in feminism and the privilege of partial perspective. *Feminist Studies* 14(3): 575-599.
- Hernes T. (2007) *Understanding Organisation as Process: Theory for a tangled world*, London: Routledge.
- Ho-Lem C, Zerriffi H and Kandlikar M. (2011) Who participates in the Intergovernmental Panel on Climate Change and why: A quantitative assessment of the national representation of authors in the Intergovernmental Panel on Climate Change. *Global Environmental Change* 21(4): 1308-1317. DOI:10.1016/j.gloenvcha.2011.05.007
- Hobbes T. (1651) *Leviathan, or, The matter, form, and power of a common-wealth ecclesiastical and civil*, London: Andrew Crooke.
- Hughes H and Vadrot ABM. (2019) Weighting the World: IPBES and the Struggle over Biocultural Diversity. *Global Environmental Politics* 19(2): 14-37. DOI:10.1162/glep_a_00503
- Hulme M. (2010) Problems with making and governing global kinds of knowledge. *Global Environmental Change* 20(4): 558-564. DOI:10.1016/j.gloenvcha.2010.07.005
- Hulme M and Mahony M. (2010) Climate change: What do we know about the IPCC? *Progress in Physical Geography* 34(5): 705-718. DOI:10.1177/0309133310373719
- Hulme M, Mahony M, Beck S, et al. (2011) Science-policy interface: beyond assessments. *Science* 333(6043): 697-698. DOI:10.1126/science.333.6043.697
- IPBES. (2012) Functions, operating principles and institutional arrangements of the Intergovernmental Science-Policy Platform on Biodiversity and Ecosystem Services. Bonn, Germany: IPBES.
- Jabbour J and Flachsland C. (2017) 40 years of global environmental assessments: A retrospective analysis. *Environmental Science & Policy* 77: 193-202. DOI:10.1016/j.envsci.2017.05.001
- Jasanoff S. (2003) Technologies of Humility: Citizen Participation in Governing Science. *Minerva* 41(3): 223-244. DOI:10.1023/A:1025557512320
- Jasanoff S. (2004) *States of Knowledge: The co-production of science and social order*. London: Routledge.
- Jasanoff S. (2005) *Designs on Nature: Science and Democracy in Europe and the United States*, Princeton: Oxford: Princeton University Press.
- Jasanoff S. (2010) A New Climate for Society. *Theory, Culture & Society* 27(2-3): 233-253.
- Jasanoff S. (2013) A World of Experts: Science and Global Environmental Constitutionalism. *Boston College Environmental Affairs Law Review* 40(2): 439-452.
- Jetzkowitz J, van Koppen CSA, Lidskog R, et al. (2018) The significance of meaning. Why IPBES needs the social sciences and humanities. *Innovation: The European Journal of Social Science Research* 31(sup1): S38-S60. DOI:10.1080/13511610.2017.1348933
- Kahn S. (1993) *Organising: A guide for grassroots leaders. Revised edition.*, USA: National Association of Social Works Press.

- Montana, J. (2020) Balancing authority and meaning in global environmental assessment: An analysis of organisational logics and modes in IPBES. *Environmental Science and Policy*. 112: 245-253. <https://doi.org/10.1016/j.envsci.2020.06.017>
- Koetz T, Farrell KN and Bridgewater P. (2012) Building better science-policy interfaces for international environmental governance: assessing potential within the Intergovernmental Platform for Biodiversity and Ecosystem Services. *International Environmental Agreements* 12(1): 1-21.
- Kowarsch M, Flachsland C, Garard J, et al. (2017a) The treatment of divergent viewpoints in global environmental assessments. *Environmental Science & Policy* 77: 225-234.
DOI:10.1016/j.envsci.2017.04.001
- Kowarsch M, Jabbour J, Flachsland C, et al. (2017b) A road map for global environmental assessments. *Nature Clim. Change* 7(6): 379-382. DOI:10.1038/nclimate3307
- Larigauderie A. (2015) Pollinator assessment: IPBES responds on conflicts of interest. *Nature* 517(7534): 271. DOI:10.1038/517271e
- Larigauderie A and Mooney HA. (2010) The Intergovernmental science-policy Platform on Biodiversity and Ecosystem Services: Moving a step closer to an IPCC-like mechanism for biodiversity. *Current Opinion in Environmental Sustainability* 2(1-2): 1-6. DOI:10.1016/j.cosust.2010.02.006
- Latour B. (1983) Give me a laboratory and I will move the world. In: Knorr-Cetina K and Mulkay MJ (eds) *Science Observed: Perspectives on the social study of science*. London: Sage, 141-170.
- Latour B. (1990) Drawing things together. In: Lynch M and Woolgar S (eds) *Representation in Scientific Practice*. Cambridge, MA.: MIT Press, 19-68.
- Latour B and Callon M. (1981) Unscrewing the Big Leviathan. In: Knorr K and Cicourel A (eds) *Advances in Social Theory and Methodology*. London: Routledge, 277-303.
- Löfmarck E and Lidskog R. (2017) Bumping against the boundary: IPBES and the knowledge divide. *Environmental Science & Policy* 69: 22-28. DOI:10.1016/j.envsci.2016.12.008
- Loreau M, Oteng-Yeboah A, Arroyo MTK, et al. (2006) Diversity without representation. *Nature* 442(7100): 245-246. DOI:10.1038/442245a
- Mahony M and Hulme M. (2018) Epistemic geographies of climate change: Science, space and politics. *Progress in Human Geography* 42(3): 395-424.
- Malmer P, Tengö M, Fernández-Llamazares A, et al. (2019) Dialogue across Indigenous, local and scientific knowledge systems reflecting on the IPBES Assessment on Pollinators, Pollination and Food Production, 21th to 25th January 2019, Chiang Mai and Chiang Rai, Thailand. Workshop report. Stockholm, Sweden: SwedBio at Stockholm Resilience Centre.
- Masood E. (2018) The battle for the soul of biodiversity. *Nature News* 560(23 August 2018): 423-425.
- Matulis BS and Moyer JR. (2017) Beyond inclusive conservation: The value of pluralism, the need for agonism, and the case for social instrumentalism. *Conservation Letters* 10(3): 279-287.
DOI:10.1111/conl.12281
- Miller CA. (2007) Democratization, international knowledge institutions and global governance. *Governance* 20(2): 325-357.
- Miller CA and Wyborn C. (2018) Co-production in global sustainability: Histories and theories. *Environmental Science & Policy*. DOI:10.1016/j.envsci.2018.01.016
- Minx JC, Callaghan M, Lamb WF, et al. (2017) Learning about climate change solutions in the IPCC and beyond. *Environmental Science & Policy* 77: 252-259. DOI:10.1016/j.envsci.2017.05.014
- Mitchell RB, Clark WC, Cash DW, et al. (2006) *Global environmental assessments: Information and influence*, Cambridge, MA: MIT Press.
- Montana J. (2017) Accommodating consensus and diversity in environmental knowledge production: Achieving closure through typologies in IPBES. *Environmental Science & Policy* 68: 20-27.
DOI:10.1016/j.envsci.2016.11.011
- Opgenoorth L, Hotes S and Mooney H. (2014) IPBES: biodiversity panel should play by rules. *Nature* 506(7487): 159. DOI:10.1038/506159a
- Pearce W, Mahony M and Raman S. (2018) Science advice for global challenges: Learning from trade-offs in the IPCC. *Environmental Science & Policy* 80: 125-131. DOI:10.1016/j.envsci.2017.11.017
- Pinch TJ and Bijker WE. (1994 (1989)) The social construction of facts and artefacts: Or how the sociology of science and the sociology of technology might benefit each other. In: Bijker WE, Hughes TP and

- Montana, J. (2020) Balancing authority and meaning in global environmental assessment: An analysis of organisational logics and modes in IPBES. *Environmental Science and Policy*. 112: 245-253. <https://doi.org/10.1016/j.envsci.2020.06.017>
- Pinch TJ (eds) *The Social Construction of Technological Systems: New directions in the sociology and history of technology*. Cambridge, MA; London: MIT Press, 17-50.
- Porter AJ, Kuhn TR and Nerlich B. (2018) Organizing Authority in the Climate Change Debate: IPCC Controversies and the Management of Dialectical Tensions. *Organization Studies* 39(7): 873-898. DOI:10.1177/0170840617707999
- Reid WV and Mace GM. (2003) Taking conservation biology to new levels in environmental decision-making. *Conservation Biology* 17(4): 943-945. DOI:10.2307/3588846
- Riouiset P, Flachsland C and Kowarsch M. (2017) Global environmental assessments: Impact mechanisms. *Environmental Science & Policy* 77: 260-267. DOI:10.1016/j.envsci.2017.02.006
- Sarkki S, Niemelä J, Tinch R, et al. (2014) Balancing credibility, relevance and legitimacy: A critical assessment of trade-offs in science-policy interfaces. *Science and Public Policy* 41(2): 194-206. DOI:10.1093/scipol/sct046
- Sarkki S, Tinch R, Niemela J, et al. (2015) Adding 'iterativity' to the credibility, relevance, legitimacy: A novel scheme to highlight dynamic aspects of science-policy interfaces. *Environmental Science & Policy* 54: 505-512. DOI:10.1016/j.envsci.2015.02.016
- Scott JC. (1998) *Seeing Like a State: How certain schemes to improve the human condition have failed*, New Haven, Connecticut: London: Yale University Press.
- Shapin S and Schaffer S. (1985) *Leviathan and the Air-Pump: Hobbes, Boyle, and the Experimental Life*, Princeton, N.J.: Princeton University Press.
- Stokstad E. (2019) Landmark analysis documents the alarming global decline of nature. *Science*.
- Strathern M. (2000) *Audit Cultures: Anthropological studies in accountability, ethics and the academy*. London: New York: Routledge.
- Tallis H and Lubchenco J. (2014) Working together: A call for inclusive conservation. *Nature* 515(7525): 27-28. DOI:10.1038/515027a
- Tengö M, Hill R, Malmer P, et al. (2017) Weaving knowledge systems in IPBES, CBD and beyond—lessons learned for sustainability. *Current Opinion in Environmental Sustainability* 26-27: 17-25. DOI:10.1016/j.cosust.2016.12.005
- Turnhout E, Bloomfield B, Hulme M, et al. (2012) Conservation policy: Listen to the voices of experience. *Nature* 488(7412): 454-455. DOI:10.1038/488454a
- Turnhout E, Dewulf A and Hulme M. (2016) What does policy-relevant global environmental knowledge do? The cases of climate and biodiversity. *Current Opinion in Environmental Sustainability* 18: 65-72.
- UFZ. (2011) Workshop Report: Making a difference with IPBES. May 11th – 13th 2011, Leipzig, Germany. In: Beck S and Goerg C (eds). Leipzig: Helmholtz Centre for Environmental Research – UFZ.
- Vadrot ABM. (2014) *The Politics of Knowledge and Global Biodiversity*, London: Routledge.
- van der Hel S. (2016) New science for global sustainability? The institutionalisation of knowledge co-production in Future Earth. *Environmental Science & Policy* 61: 165-175. DOI:10.1016/j.envsci.2016.03.012
- Woolhouse M and Farrar J. (2014) Policy: An intergovernmental panel on antimicrobial resistance. *Nature* 509(7502): 555-557. DOI:10.1038/509555a
- Wyborn C, Louder E, Harrison J, et al. (2018) Understanding the Impacts of Research Synthesis. *Environmental Science & Policy* 86: 72-84. DOI:10.1016/j.envsci.2018.04.013
- Yamineva Y. (2017) Lessons from the Intergovernmental Panel on Climate Change on inclusiveness across geographies and stakeholders. *Environmental Science & Policy* 77: 244-251. DOI:10.1016/j.envsci.2017.04.005