Submitted version: To appear in *Current Opinion in Environmental Sustainability*

What does policy-relevant global environmental knowledge do? The cases of climate and biodiversity

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Abstract

There is a surge in global knowledge making efforts to inform environmental governance. This article synthesises the current state of the art of social science scholarship about the generation and use of global environmental knowledge. We focus specifically on the issues of scale – providing globalized representations of the environment - and relevance - providing knowledge in a form that is considered usable for decision-making. Using the examples of the Intergovernmental Panel on Climate Change, the Intergovernmental science-policy Platform on Biodiversity and

Ecosystem Services and the Millennium ecosystem Assessment, the article discusses what policy relevant global knowledge does: how it represents the environment, and how this specific form of knowledge connects with governance and policy.

The emergence of global environmental knowledge

International conventions and regimes in the environmental and sustainability domains have always relied heavily on scientific information. A high number of institutions and organizations are currently involved in providing state of the art knowledge and information on a global scale to inform negotiations and decision making processes [1]. There are numerous examples related to biodiversity and climate, but also themes like desertification and microbial resistance are considered as candidates for global assessments. This is not the place to explore the question of why or how exactly these assessments have come into existence for environmental and sustainability issues and not for so many other international conventions and regimes. Yet it is telling of the largely technocratic and science-based character of environmental decision-making more generally.

Global environmental assessments have to meet a number of challenges. One of these is the issue of scale. In order for environmental knowledge to be relevant for global scientific and policy actors, it must speak at the global level. Knowledge about specific localized places must be scaled up to the global level, for example by using models or by integration with satellite based information. This process of scaling up consists of multiple steps of translation during which fragments of knowledge get modified and gain new meanings. In the end, what is produced is a very specific form of knowledge: one that has become decontextualized and is suggestive of certain policy interventions [2-4]. In other words, global environmental knowledge is crucial for framing environmental change as a global problem and for finding solutions that are salient for global governance actors.

This brings us to the second key challenge of global environmental knowledge: policy relevance. Generally speaking, global environmental knowledge is produced with the explicit aim of being in some way relevant for decision-making while remaining objective and neutral. The phrase that this knowledge should be policy relevant, yet policy neutral and not policy prescriptive has become somewhat of a mantra in various global environmental assessment initiatives [5]. The production of what is considered policy relevant knowledge involves a process of translation during which

knowledge is repackaged using specific terms that are considered to be attractive for and speak to the needs of decision makers [6,7].

This brief article draws on studies in critical political ecology, political science and governance studies, and science and technology studies to explore the effects of global policy relevant environmental knowledge. This brief article draws on studies in critical political ecology, political science and governance studies, and science and technology studies to explore the effects of global policy relevant environmental knowledge. This focus on the effects of knowledge draws attention to the ways in which knowledge exercises a certain form of -epistemic – power [8], which affects not only how we understand the environment but also, and at the same time, how we act upon this environment [9]. This more pervasive form of power is implicated in all forms of knowledge production and goes beyond the question whether policy makers listen to what scientists have to say and implement their recommendations; indeed, most forms of environmental knowledge, and particularly global forms perhaps, are often not seen as very powerful in that sense.

We focus on three of the most prominent examples of environmental assessments to illustrate our arguments: the Intergovernmental Panel on Climate Change (IPCC), the Millennium ecosystem Assessment (MA), and the Intergovernmental science-policy Platform on Biodiversity and Ecosystem Services (IPBES). There are important differences between these three: the MA was a single assessment commissioned by the Convention on Biological Diversity while the IPCC and IPBES are intergovernmental bodies that undertake - in the case of the IPCC - or plan to undertake - in the case of IPBES – multiple and repeated knowledge assessments. We have selected these three because they are well documented in the literature, because they explicitly aim to inform decision-making and governance, and because they vary in terms of the approach to assessment - including questions of scale and relevance - that they take or plan to take. As such, we expect that they will offer critical insight into the different implications of scaling and policy relevance for environmental knowledge and decision-making.

Globalizing the environment

Since the IPCC was created in 1988, the knowledge it has presented to the world has remained heavily framed by the paradigm of global climate modelling and Earth System Science [10]. Over five full knowledge assessment cycles, the IPCC has conceptualized climate first and foremost as ‘global’, indexed iconically through the

global-mean surface air temperature. Although the IPCC has never formally debated and adopted a unifying conceptual framework – unlike IPBES [11] - its default position has been to approach climate as a single, interconnected, physical system. This entrenched view was re-expressed recently by Thomas Stocker, the outgoing Co-Chair of Working Group 1 (WG1) of the IPCC's Fifth Assessment Report (AR5). Commenting on the possible structure of the future AR6 Stocker said:

> "Many other opinions and suggestions have been aired. Regionalization of IPCC assessments is sometimes called for to give policy-makers and practitioners more and better regional information. In our view, this approach would undermine *the global character of the climate-change problem exemplified by the IPCC*" [12] (p. 165, emphasis added).

This view of climate change as meaningful only in terms of its global character is one that the IPCC inherited and yet at the same time has helped to shape. Since the 1950s, the idea of 'climate' in western science evolved from being predominantly interpretative, and hence geographically differentiated, to becoming enumerated and hence readily globalized [13]. The era of satellites and computer models and a globally connected network of scientific institutions and practices enabled this new global construction of climate to prevail. Climates - plural and situated in places - became global climate, singular and placeless. Regional climatic variations became interpreted through the narrative of global climate change, while global climate became the entity to be predicted by the new Earth System science.

Although the IPCC assessments acknowledge the importance of regions -for example through incorporating regional climate models such as PRECIS [14] and through the regional assessments of impacts in Working Group 2 - climate knowledge in the IPCC is still conditioned on the simulations of global climate models (GCMs; also Earth System Models). The flow of knowledge is one way (as too is causation [15]): from the global to the regional and, occasionally, to the local. Similarly Working Group 3 of the IPCC – dealing with the mitigation of climate change - evaluates global-scale studies which analyse technological, economic and land use options for intervening to achieve global objectives, for example managing global carbon budgets or global temperature. Indeed, the clearest example of the globalizing instinct of the IPCC's climate knowledge assessment has been the reification of global temperature. This indexed quantity – whether constructed from thermometer measurements, calculated from satellite retrievals, reconstructed from proxies or modelled through computer code – has become central to the language of climate change.

While in the case of climate, the global character of knowledge has become almost self-evident – greatly facilitated by the prominent use of GCMs and the notion of global temperature - this is arguably less so for biodiversity. No universally accepted standardised measures and metrics currently exist for the global assessment of biodiversity and there is much debate about the desirability of standardization of biodiversity knowledge. Drawing on an analogy with the IPCC's GCMs, a comment in *Nature* called 'Time to model all life on earth' argues that:

> "General ecosystem models (GEMs) could radically improve understanding of the biosphere and inform policy decisions about biodiversity and conservation. Currently, decisions in conservation are based on disparate correlational studies, such as those showing that the diversity of bird species tends to decline in deforested landscapes. GEMs could provide a way to base conservation policy on an understanding of how ecosystems actually work" [16] (p. 295).

IPBES also stresses the need for aggregation of biodiversity knowledge; hence the lack of standardized data, clear definitions and common methods for biodiversity assessment is considered an important obstacle for biodiversity governance and conservation [17].

However, urges for evermore complete, standardized and globalized environmental knowledge are increasingly met with criticisms. It has been argued that the global mode of knowledge making of the IPCC pays little attention to the multiple ways in which humans come to know their climates, or of how they live in places and imagine their futures [18,19]. These latter ways of knowing are embedded in local cultural practices and memories. The IPCC's appropriation of global knowledge means that place-based or indigenous knowledge becomes marginalized from the dominant centres and methodologies of global knowledge production and mobilization [20]. Fogel makes a similar argument when discussing the global representation of the climate as a space devoid of people and amenable for global kinds of (earth system) governance [2]. Also in the case of biodiversity, authors have argued that the standardization and globalization of biodiversity knowledge may end up alienating local people and their diverse ways of knowing and living with biodiversity [7,21].

Taking a Foucauldian[8] stance, Radcliffe et al. [22] argue that global knowledge is a violence done to people and things: global discourses of sustainability, survival or decline, even when they evoke specific peoples, places and cultures, inevitably end up appropriating these objects by reducing them to commensurate with global kinds

of knowledge and the associated ideals of global governance and control [23].

Although IPBES is often portrayed as the IPCC for biodiversity [24], the general consensus is that biodiversity needs a different approach [21,25]. Global biodiversity assessments have recognized the problems of globalized and standardized knowledge and the dilemma between assessing biodiversity in a way that can be globally compared and aggregated and making sure that these assessments are locally relevant and meaningful. The MA for example adopted a multi-scale approach including global, sub-global and thematic assessments [26]. This multi-scale approach was seen as a way to ensure the connection with different governance levels. The sub-global assessments allowed for flexibility and variation in standards, problems framings and methodologies, thus trading a degree of standardization for increased local/regional meaningfulness of the assessments [27]. In IPBES, the importance of the sub-global level is also recognized, but this recognition has so far not been reflected in the institutionalization of IPBES. Regional hubs and regionalized structures have been proposed as a way of dealing with the challenges posed by the biodiversity problems in different regions of the world, and as a way to take into account local and indigenous communities [26]. However, reaching a decision on the regional approach has proven very difficult, and disagreements have emerged over how to understand the notion of region itself. ‘Regions’ also possibly interfere with the influence of individual member countries, so national state delegates have so far mostly defaulted to the global structure of the IPBES [26].

Constructing policy relevance

From their inception, there has been an explicit understanding that the global knowledge made by the IPCC, the MA and IPBES will be relevant for political deliberation and policy development. This view was expressed in the First IPCC Assessment Report in 1990 by Sir John Houghton, Chair of WG1: “I am confident that the [IPCC] Assessment ... will provide *the necessary firm scientific foundation* for the forthcoming ... negotiations on the appropriate strategy for response and action regarding the issue of climate change” [28] (p. V, emphasis added). An early press release about IPBES released by UNEP echoes this sentiment: “the IPCC-like platform will bridge the gulf between the wealth of scientific knowledge … and decisive government action required” [29].

Policy relevance is only possible if knowledge and dominant problem framings are aligned and if knowledge focuses on those aspects of the environment that are

considered usable. For the IPCC, this means that knowledge is expected to contribute to the management of global temperature. This is the central organizing paradigm of the IPCC around which scientific knowledge is assessed and different policy options evaluated. For example, the global temperature index, global warming potentials, the global carbon budget and Earth System models all become means through which certain forms of governing action become imaginable and executable [3]. The climate is to be governed in such a way as to stabilise global temperature below the '2 degree' target.

This remarkable subjugation of climate-society relations to a singular global measure and associated goals carries repercussions. For example, human security becomes narrowly defined in terms of an indexed global climate, effective political leadership in the world is reduced to securing the '2 degree' target and certain forms of technological adventurism - for example the creation of a 'global thermostat' [30]- become imaginable [31]. The consequences of this manoeuvre are explained by Luers and Sklar:

> "The focus on a single [temperature] target has now become an obstacle because it reinforces three key problems: it frames climate change as a distant abstract threat, it impedes integration of mitigation and adaptation, and it fails to recognize the diversity of values and risk perceptions of people around the globe" [32] (p.1).

It is increasingly clear the IPCC's global kinds of knowledge do not match well with the shifting politics of climate [33]. Although the UNFCCC has organised its negotiations around global temperature and global carbon budgets -- maintaining the claim of climate change as a global problem -- the locus of climate mitigation policy development has increasingly moved beyond the level of the state [34]. With respect to meeting the needs of adaptation [35], the knowledge made by the IPCC has proven stubbornly deficient. Beck argues that climate adaptation needs a different kind of research that:

> "Seeks to understand the interaction between climate and society ... [and focuses] … on providing information that is useful for addressing regional and short-term problems—such as health issues and extreme events" [36] (p. 304).

For biodiversity, no central indexed quantity comparable to global temperature is in place. Indexes for species diversity - based on current state of and trends in distribution and abundance – and red lists are commonly used, but their policy relevance is often contested. To remedy this, both the MA and the IPBES have relied

on the concept of ecosystem services as a way to highlight the relevance of nature to society. As Bob Watson, a key figure in the IPCC, the MA and IPBES explains:

> "We cannot simply talk about monitoring birds and butterflies … it has little or no chance of working. We have to link … biodiversity to … issues that policy-makers and the majority of the general public care about. This can be done by … ecosystem services" [37] (p 471).

The concept of ecosystem services is not just a way to communicate the importance of biodiversity, it also allows for global aggregation into one number [38]. By foregrounding the economic value of biodiversity, IPBES frames the relation between humans and nature as an economic exchange relation, implying the equivalence and substitutability of services that are of similar value to people [7,39,40]. In doing so, its proponents believe, if offers a way to include biodiversity concerns into mainstream economic activities in a way that appeals to the primary target audience of IPBES' knowledge: nation states. As with the IPCC, consensus-based knowledge expressed in the language of ecosystem services is assumed to facilitate consensus in intergovernmental negotiations.

Many others are critical about the usefulness of the concept of ecosystem services. They argue that actual practices of biodiversity conservation are not motivated by economic concerns and that the concept of ecosystem services may disenfranchise those approaches [41]. Secondly, they warn that even if actors are incentivized by financial rewards to conserve biodiversity, it is unlikely that the payments will be high enough to compete with other forms of land-use that involve biodiversity destruction [42]. Although policy relevance is an important justification for the concept of ecosystem services (as we have argued it also is for the concept of global temperature), its potential for informing and catalysing effective action on the ground may in fact be very limited (as too with global temperature).

The multi-scale approach of the MA was intended to include local and indigenous knowledge to ensure the local relevance and meaningfulness of the assessments [26,43]. However, this proved hard to implement, because the MA was also driven by the search for a standardized consensus view on biodiversity knowledge. Despite considerable effort, the main conceptual framework of the MA remained strongly embedded in science and only one of the sub-global assessments came up with an alternative conceptual framework based on indigenous knowledge [43].

Drawing on lessons learnt from the MA, IPBES puts much emphasis on including different ways of knowing and making sure that its knowledge is relevant for a wide

variety of actors on multiple levels [44]. A recent result of these efforts is the IPBES conceptual framework [11]. It uses a colour code system that represents key concepts in multiple ways, according to different ways of knowing nature and biodiversity. For example, the broad category of 'nature's benefits to people' is framed as 'ecosystem goods and services' as part of western science-based knowledge, and as 'nature's gifts' as part of other knowledge systems. This makes clear that the question of what knowledge is relevant and for whom is closely related to epistemology, particularly when it comes to the involvement of local and indigenous communities.

The IPBES conceptual framework has been heralded as a 'Rosetta Stone' representing and translating between different knowledge systems, in order to ensure that knowledge is relevant for multiple audiences [11]. More than a simple translation device, however, this framework is a boundary object resulting from a process in which experts forged a clever compromise amidst controversy about science, local and indigenous knowledge, ecosystem services and the commodification of nature [45]. However, both the feasibility and desirability of the conceptual framework of IPBES are being contested with the argument that IPBES should stick to standardized and science-based assessments [46]. It remains to be seen how and to what extent multiple ways of knowing will actually inform the assessments, and to what extent other knowledge systems will need to be made compatible with scientific knowledge for this purpose [40]. Thus, for whom the IPBES knowledge will be made relevant is still an open question.

The performativity of knowledge

The combined forces of globalization and policy relevance have profound implications for environmental knowledge; what it looks like, what problem framings it supports and helps shape, and what actors it attracts as target audiences. For the sake of policy relevance at the global level, specific choices are made as to what knowledge should be generated which, in turn, influences what forms of governance are made possible.

The global assessments discussed in this article can be seen as symptomatic of a wider globalizing instinct in environmental knowledge and governance [3,47,48]. Such globalized knowledge offers de-contextualized, top-down views of the planet and the processes of knowledge making become detached from the ways that knowledge is made meaningful [18]. Through bringing a particular kind of knowledge

about the environment – global temperature or ecosystem services - into circulation, other possible regional or local signs of a changing climate or biodiversity loss that may have greater importance for mobilizing and constraining society and resources disappear from view. Geography – apprehending difference, heterogeneity and complexity in the interactions between societies and natures – thus gets crowded out by the construction of globalized knowledge and associated discourses of global environmental change and governance.

There is more at stake than the purported (lack of) relevance of global environmental knowledge; it is important to consider the power structures that this knowledge makes possible. The IPCC and IPBES, perhaps less so the MA, reflect the ideals of high modernism as discussed by Scott [49]. Governments of the modern era have sought to exercise their powers of regulation and control through enumeration of an expanding array of subjects. These projects involve two key stages [50]. First, indexical representations of the phenomenon to be governed are constructed. Second, the technologies of state intervention are mobilised to manipulate that index towards the desired goal. In other words, the global kinds of knowledge about climate and biodiversity that are made by the IPCC and IPBES (and the MA) serve particular expressions of power.

The application of power in and through knowledge practices is also present on a more implicit level. Categories have practical consequences [51]. Packaging knowledge in policy relevant categories like global temperature or ecosystem services is not a neutral act of translation, but an intervention where knowledge not only represents, but at the same time also constitutes these categories as objects amenable for governance [52,53]. There is a problematic circularity at work here: scientific knowledge and its attendant political rationality defines the object of climate and biodiversity governance. The same forms of global knowledge, now under demand for ever-greater precision, are then used by new global governance systems to regulate the planet to this end. Knowledge and power embrace tightly as globalized knowledge conditions the political imaginary of global environmental governance and vice versa: how one knows constrains how one governs and how one governs shapes what one needs to know.

In a very real sense, we are increasingly living in a world that is considered uncritically to possess ‘a global temperature’ that can or should be controlled [54] and a world that is made up of ecosystem services that can be mapped, valuated and exchanged [55]. In that way knowledge practices are tied to political rationalities that make the application of power seem both natural and inevitable [17].

Consequently, attempts to break this cycle are not just difficult, but seen as subversive; as Foucault has argued, when truth regimes like the IPCC become dominant, the only options are to either be co-opted or to actively resist them [56]. For example, in direct response to criticisms of the IPCC in 2009, the Indian Government established its own Indian Network for Climate Change Assessment. In drawing upon "longer traditions of national territorial knowledge-making, allowing a rescaling of climate change according to local norms and practices of linking scientific knowledge to political action" [57] (p.109), India issued a challenge to the hegemonic co-construction by the IPCC and the UNFCCC of a globalised climate change.

Compared to the IPCC, IPBES is not as strongly institutionalized as a truth regime. As we have shown, the concept of ecosystem services, although widely accepted, has not (yet) accomplished complete standardization and global aggregation of biodiversity knowledge at the expense of local and indigenous knowledge. Some of IPBES' built-in institutional mechanisms may also prevent this from happening. IPBES's mandate is broader than only producing global assessments and it also aims to support policy formulation and implementation and contribute to capacity-building [58]. Particularly the capacity-building function may be able to attend to the needs of less advantaged groups in the science-policy interface, and has the potential to give them a stronger voice in defining what counts as relevant biodiversity knowledge.

The contestations over the categories used to express climate or biodiversity are a useful reminder of the politics of knowledge. As we have argued in this article, the performativity of knowledge and the intimate connections between power and knowledge imply that the environment to be governed and the knowledge used to represent that environment are inextricably entwined and coproduced. In that way the claim of the global assessments discussed here to be policy relevant whilst remaining policy-neutral becomes hard to defend [59,60]. So, what does policy-relevant global environmental knowledge do? We suggest that in the end, and in some sense, being policy relevant is to be policy prescriptive.

Acknowledgements

The writing and publication of this article have been supported by the Wageningen University strategic IP/OP research theme "Informational Governance".

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