Somewhere between everywhere and nowhere: the institutional epistemologies of IPBES and the IPCC

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In this paper we draw on science and technology studies (STS) approaches to develop the first comparative analytical account of the Intergovernmental Panel on Climate Change (IPCC) and the Intergovernmental Platform for Biodiversity & Ecosystem Services (IPBES). The establishment of both of these organisations, in 1988 and 2012 respectively, represented important 'constitutional moments' in the global arrangement of scientific assessment and its relationship to environmental policymaking. Comparing their two histories to date, we focus here on the role of authoritative conceptual frameworks, consensus and argumentation in the production of knowledges about climate change and biodiversity. This enables us to explore the geographies which produce these knowledges (the socio-spatial constitution of different sites of knowledge production) and the geographies which these knowledges enact (through diverse representations of space).

We argue that, broadly speaking, the IPCC has aimed to produce a 'view from nowhere', through a reliance on mathematical modelling to produce a consensual picture of global climate change, which is then 'downscaled' to considerations of local impacts and responses. By contrast IPBES, through its contrasting conceptual frameworks and practices of argumentation, appears to seek a 'view from everywhere', inclusive of epistemic plurality, and through which a global picture emerges through an aggregation of more placed-based knowledges. We conclude that, despite these aspirations, both organisations offer 'views from somewhere' – situated sets of knowledge marked by politico-epistemic struggles and by the interests, priorities and voices of certain powerful actors. We suggest that characterizing this 'somewhere' might be aided by developing the concept of *institutional epistemology*.

1. Introduction

1.1. Global environmental change and GEAs

As illustrated by the recent discussions taking place in the context of the International Commission of Stratigraphy, we may decide that we have entered the Anthropocene – a new geological era in which human societies have acquired the ability to alter significantly geophysical and biogeochemical processes (e.g. Zalasiewicz et al. 2011). While a decision over the official denomination of this proposed new era will be taken in 2016, awareness of human impacts on the planetary environment is nothing new (e.g. Locher & Fressoz, 2012; Barnett, 2015). Over the past decades science and scientists have played a key role in documenting the diverse damages caused by human societies on their environment: identifying, for example, the role of chlorofluorocarbons in causing ozone depletion, or rising emissions of greenhouse gases as one of the main drivers of anthropogenic climate change.

In this context, global environmental assessments (GEAs) have become key mechanisms to organize the provision of 'policy relevant' knowledge and advice to governments and for multilateral environmental agreements (MEAs) about transnational environmental issues. GEAs first emerged in the field of atmospheric and climate science and the International Ozone Assessment (IOA), initiated in 1981 under the auspices of the World Meteorological Organization (WMO), is generally recognized as the first major GEA. The IOA was arguably key in triggering the development of an international regulatory regime for the stratosphere (Litfin 1995), leading to the reinforcement of the Vienna Convention for the Protection of the Ozone Layer and to the adoption of the Montreal Protocol on Substances that Deplete the Ozone Layer (1987). Since then 'GEAs have become all the rage' (Scoones 2009:547) and a number of negotiations regarding the establishment of similar expert organizations are currently on-going; possible options include an expert panel on land degradation that would serve the United Nations Convention to Combat Desertification (Thomas et al. 2012) and, in the field of public health, an intergovernmental panel on antimicrobial resistance:

> 'We believe that similar global approaches should be attempted to address problems in public health. There is a need for a powerful panel to marshal the data to inform and encourage implementation of policies that will forestall the loss of effective drugs to resistance, and to promote and facilitate the development of alternatives — a panel akin to the IPCC, and the analogous Intergovernmental Science-Policy Platform on Biodiversity and Ecosystem Services founded in 2012' (Woolhouse & Farrar 2014:556).

In this paper we draw on science and technology studies (STS) approaches to develop the first comparative analytical account of the Intergovernmental Panel on Climate Change (IPCC) and the Intergovernmental Platform for Biodiversity & Ecosystem Services (IPBES). The establishment of both of these organisations, in 1988 and 2012 respectively, represented important 'constitutional moments' (Jasanoff 2003) in the global arrangement of scientific assessment and its relationship to environmental policymaking. The Intergovernmental Panel on Climate Change (IPCC) is certainly the most prominent example of such mechanisms, jointly receiving the Nobel Peace Prize in 2007 and serving as a role-model for the development of other scientific assessments, including IPBES.

The IPCC has been instrumental in putting the issue of anthropogenic climate change on the international agenda and the publication of the IPCC assessments reports (respectively in 1990, 1995, 2001, 2007 and 2013/14) have become important events punctuating the life of the international negotiations on climate change conducted under the United Nations Convention on Climate Change (UNFCCC). In contrast, IPBES is an emergent institution of global expert advice whose objective is to tackle the loss of biodiversity, the degradation of ecosystem services, and to improve human well-being. It was formally established in 2012, following a long process of consultations and negotiations that lasted seven years (Granjou et al. 2013) and has not yet produced any report. In many aspects, IPBES seeks to build on previous assessments initiatives (e.g. Global Biodiversity Assessment, 1995; Millennium Ecosystem Assessment, 2005), as well as on the experience of the IPCC. But IPBES is much more ambitious than these earlier initiatives as it aims to fulfil four functions, including performing assessments, providing policy support; ensuring capacity-building and catalysing knowledge-generation.

While IPCC and IPBES have different objectives, they share similar aspirations to provide global knowledge, through intergovernmental processes, to underpin political debates about, respectively, climate change and biodiversity loss. They therefore provide sites at which to study contemporary mechanisms of international collaboration in the construction of globally credible and 'policy-relevant' knowledge. Moreover, as mentioned above, GEAs are increasingly in demand. Yet, their authority and credibility have also been challenged in a number of ways, both internally – by participants in these GEAs, and externally – by diverse publics including academics (see e.g. Scoones 2009; Hulme & Mahony 2010). While GEAs aspire to be globally authoritative, they are also sites of contestation were competing knowledge-claims and diverging views and interests are articulated. Although the IPCC is often regarded as a successful organization, it has also suffered several controversies and undergone a number of reform processes, as will be elucidated below (IAC 2010; Beck 2012).

1.2. GEAs and the geographies of knowledge

GEAs have been studied by academics in different ways. A first approach developed by social science scholars has been, echoing the concerns of many practitioners, to identify the conditions under which these mechanisms can actually work, i.e. influence policy-making (e.g. Farrell et al. 2001; Clark et al. 2006). Exploring another line of inquiry, scholars in STS, human geography, and critical social sciences, whose work we seek to build upon, have focused on the role of GEAs as sites of knowledge production. Such studies outline some critical challenges, drawing in particular on the idea that science is never neutral with regard to politics and policy, and that the forms of knowledge produced in GEAs cannot be separated from the forms of policy advice that are being formulated (e.g. Turnhout et al. 2014; Miller 2004). These studies are often closely related to work that explores the democratic challenges which inhere in efforts to re-scale responsibilities for knowledge-making and policy deliberation away from the nation state (e.g. Miller 2007; Beck 2011). Most specifically, several scholars have called for the development of more pluralist GEAs, building on the assumption that these organizations are not solely about science-policy relations but rather about science-policy-society relations and that GEAs should engage more broadly with diverse components of civil society to improve their public accountability (Beck et al. 2014). This assumption rests on deliberative democratic ideals and is also driven by the recognition that the credibility of GEAs, and therefore their effectiveness, depends on their ability to be trusted by multiple audiences and that 'trust' is a relational construct (Jasanoff 2007b).

The co-productionist idiom which posits that 'the ways in which we choose to know the world are inseparable from the ways in which we choose to live in it' (Jasanoff 2004: 3) can serve as a useful starting point to conceptualize GEAs. In contrast to philosophical or essentialist approaches to the question 'what is science?', the novelty of STS scholars and constructivist historians and geographers of science has been to seek answers to this question by situating scientific practices, providing rich ethnographic and empirical accounts of science in the making. Scholars working in an Actor Network Theory (ANT) tradition have intensively studied laboratories and other sites of contemporary scientific practice. Concurrently, historians and geographers of science have also approached science as a socio-cultural practice, providing thick descriptions (Geertz 1973) of the places and spaces of knowledge-making, including houses of experiments, botanical and zoological gardens, cabinets of accumulation, fields and hospitals (Livingstone 2003). This interest in the importance of place in scientific inquiry has been labelled a 'spatial turn' in the history and sociology of science (Powell 2007; Finnegan 2007).

By localizing scientific practices, STS scholars, historians and geographers of science have questioned the unity of science and demonstrated that there are multiple ways of knowing, including different 'epistemic cultures' between scientific disciplines (e.g. Knorr-Cetina 1999), or different national 'civic epistemologies' in the application of scientific knowledge in public debates (Jasanoff 2005). In this sense, a key tenet of STS is that scientific knowledge is unavoidably *situated* (Haraway 1988). Rather than the 'view from nowhere', scientific knowledge is always a 'view from somewhere'. As Shapin (1998) has argued, conventional understandings of science have equated truthfulness with placelessness; i.e., true science represents the 'view from nowhere', while "the claim that knowledge is geographically located is widely taken as a way of saying that the knowledge in question is not authentically true at all" (ibid: 5). STS scholars, by contrast, do not seek to challenge science's claims to truthfulness by pointing to the ways in which scientific knowledge is marked by the traces of place; whether that be in the form of local epistemic, institutional or political cultures. Rather, such approaches acknowledge the situatedness of scientific knowledge and move on to ask pressing questions about how it is that knowledge is able to travel between places, to transcend cultural distances, and to 'bridge' social worlds. What are the social and cultural processes that allow certain 'views from somewhere' to become authoritative and credible; to even become accepted as a 'view from nowhere'?

Applying these questions to GEAs constitutes an invitation to approach critically the kinds of knowledges assessed and rendered authoritative in GEAs, as well as the ways in which demarcations between 'local' and 'global' knowledges are made. In this perspective, if universal knowledge can be achieved then it is knowledge which is credible to everyone – for GEAs this implies achieving credibility across a wide range of socio-cultural and geographical settings, and in this view achieving 'credibility', 'relevance' and 'legitimacy' is necessarily a relational process that involves recognizing the existence of multiple of ways of knowing. Moreover, these STS insights suggest that if localizing science is a valuable way of understanding the nature of scientific practice, we might say that GEAs too are made of places; developing fine-grained accounts of the particular spaces in which GEAs are produced can help us understand how relations between science and policy, between 'local and global', and between different epistemic cultures, are being negotiated and ordered.

In a first approximation, IPCC and IPBES both seek to bridge gaps in two dimensions: a horizontal one between science and policy, and a vertical one between local and global scales. Within these ambitions there arguably lies a 'linear' conception of the relationship between science and policy, associated with a view of science as producing universal, disinterested and value-free knowledge. Furthermore, efforts to bridge local and global scales likewise take the multi-scalar dimension of the world as given, viewing the 'local' and the 'global' as fundamentally distinct spatial realities. However, as documented by STS and interpretive scholars, neither of these dimensions – science/policy, local/global – exist naturally and are better understood as resulting from processes of co-production (Gieryn 1983; Jasanoff & Martello 2004; Hulme 2010). From a co-productionist perspective, the boundaries of 'science' are constantly re-negotiated: science and policy are understood as mutually constituted and science can never unconditionally speak 'truth to power' (Wildavsky 1979). For example, several authors have demonstrated that the uneven geography of expertise characterizing the IPCC was a factor affecting the framing of climate change, hampering the IPCC's credibility among certain audiences and leading to a lack of policy influence, especially in many developing countries such as India (Kandlikar & Sagar 1999; Biermann 2001; Mahony 2014b) and Brazil (Lahsen 2004; Fogel 2004).

All through the process leading to the establishment of IPBES, the IPCC has functioned as something of a role model. Scientists affiliated with global change research programmes, such as DIVERSITAS, have repeatedly called for the establishment of an 'IPCC-like mechanism' for biodiversity (Larigauderie & Mooney 2010). However, IPBES also aspires to draw the lessons from previous GEAs and to be designed for biodiversity issues, most particularly to work closely with social sciences, and also to be based on a broad knowledge base including 'traditional and indigenous knowledge'(Duraiappah & Rogers 2011; Mooney et al. 2013). In many aspects IPBES aims at constructing what we will refer to as a 'view from everywhere': that is, being inclusive of developed and developing countries, while encompassing a broad range of knowledges including 'place-based' knowledges and indigenous and local knowledge. This ambition contrasts markedly with the IPCC, which, as we will argue, has constructed a dominant view of climate change based on a 'view from nowhere', relying predominantly on physical science knowledge and on modelling practices based on mathematical equations. Although climate was once understood as a 'local' phenomenon (Heymann 2010), the IPCC has constructed representations of climate change as a global issue relying predominantly on physical modelling of a global climate *system* (Miller 2009).

In this respect, it is worth underlining that the IPCC has adopted an organizational structure with working groups organized around different disciplines: the IPCC is managed by a Bureau which oversees the work of the three IPCC Working Groups. Each of these groups is in charge of reviewing the research regarding a particular aspect of climate change: Working Group I is charged with the 'physical scientific aspects of the climate system', Working Group II focusses on the 'vulnerability of socio-economic and natural systems to climate change' and attempts to identify options for adaptation, while Working Group III focusses on 'options for mitigating climate change through limiting or preventing greenhouses gas emissions'. These groups are marked by disciplinary distinctions: while WGI gathers mostly climate scientists, economists and social scientists are more involved in WGII (impacts) and WGIII (responses). Such distinctions have been criticized for creating a hierarchy between disciplines – with a domination of physical sciences - as well as disciplinary silos that hamper cross-disciplinary interactions (Bjurström & Polk 2011b; Godal 2003). In contrast, IPBES seek to implement a distinct type of organization in which the composition of each working group is regulated by the principles of gender, regional and disciplinary balance, rather than simply relying on disciplinary or topical delineations.

From an STS standpoint, GEAs are sites of co-production, in which particular ways of knowing are rendered authoritative, therefore making possible or facilitating some forms of governance: by delineating what counts as 'policy-relevant' knowledge they also contribute to the constitution of natural and social orders. In doing so they perform a kind of 'epistemic constitutionalism' (Miller 2009) and by 'zooming in' on the particular *institutional epistemologies* (i.e. practices of knowledge-making and ways of knowing institutionalized by these organizations) we seek to explore how they do so. We initially develop our comparative insights between the IPCC and IPBES along two thematic strands: (1) conceptual frameworks and scenarios; and (2) argumentation and consensus. However, in conclusion we suggest a number of other strands through which the notion of institutional epistemology may be developed through comparative analysis.

2. Methods and materials

In this paper we develop a comparative account between the IPCC and IPBES using qualitative research methods and interpretive analysis. We draw on a broad range of primary materials including expert interviews with natural scientists, social scientists, United Nations officers, diplomats, policy-makers) directly engaged in IPCC/IPBES, or following these processes closely, and original documents including official reports, proceedings, and workshop reports. In particular, data on the development of the IPBES conceptual framework draws on 10 semi-structured interviews with experts (including ecologists, social scientists), members of IPBES governance bodies and of IPBES delegations. We also rely on ethnographic data based on participant observations conducted during the first and second IPBES plenary sessions (IPBES-1, Bonn, January 2013; IPBES-2, Antalya, December 2013).

3. Conceptual frameworks and scenarios

Whether implicitly or explicitly, all GEAs act within certain epistemic frameworks which enact particular forms of collaborative knowledge-making. These frameworks delineate whose knowledge and expertise should be included, or excluded, in the production of assessments. These frameworks, which may often be contested, have found visual expression -- for example the 'Bretherton diagram' of the climate system used implicitly by the IPCC or the 'Rosetta Stone' diagram recently adopted by IPBES. What effects do these frameworks and visualisations have on the kinds of knowledges and expertise which are sought and how do they facilitate new forms of collaborative knowledge-making practice?

3.1. IPCC & Earth System Sciences

According to Hulme, three main elements are suggestive of the framing of climate change as adopted by the IPCC: " a globalised atmosphere (…) which offered the world a single depository for greenhouse gas emissions and which opened the way for predictive climate modelling; the goal of a stabilised global climate as the centrepiece of policy; and the institutionalising of mitigation and adaptation as co-dependents in future global climate policy regimes"' (Hulme 2008: 6). The first point – the stabilisation of predictive, global climate modelling as a dominant epistemic strategy (see Shackley et al. 1998) – was an important prior condition for the next two elements of the IPCC's implicit assessment framework. Although the IPCC has not officially adopted an explicit conceptual framework, the Bretherton diagram (**Figure 1**), which is a representation of the different geophysical components of the Earth System (NASA 1986) is often recognized as having influenced the framing of climate change as adopted by the organization: excluding, until recently, the 'human dimension' from the picture (Mooney et al. 2013).

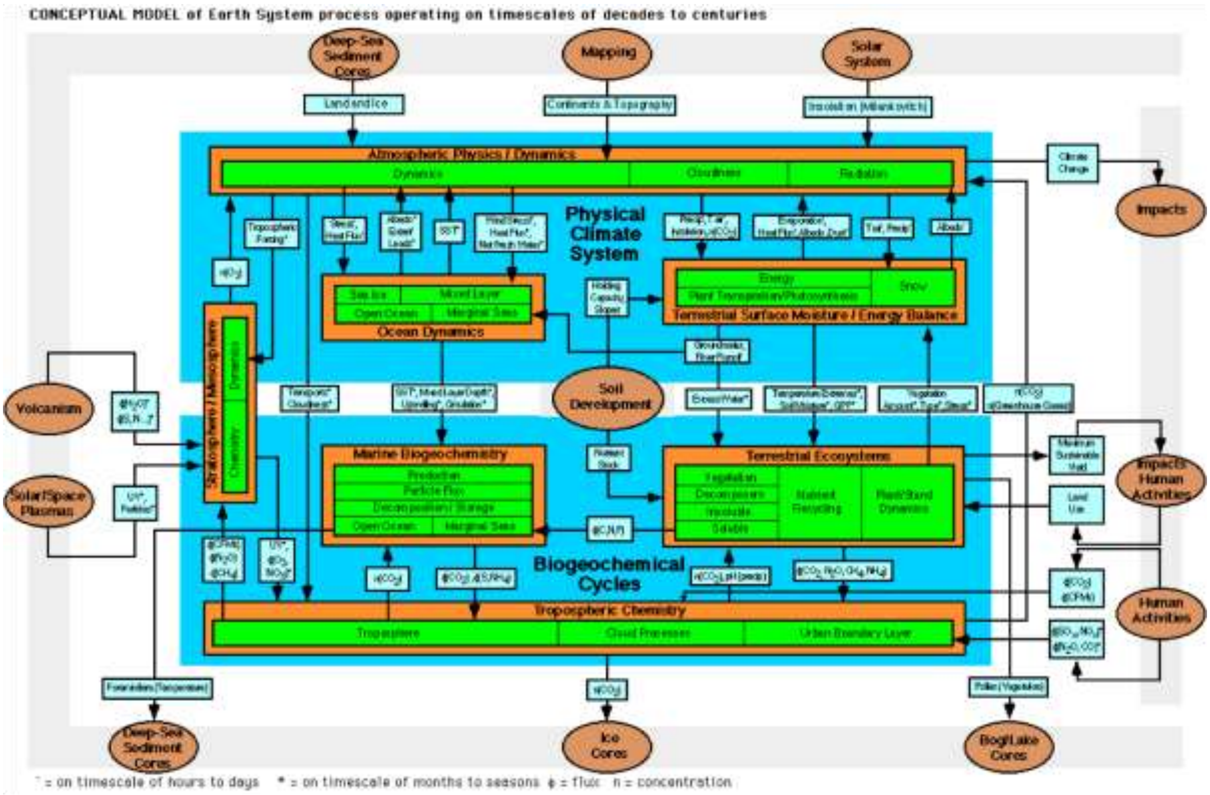

Figure 1. The 'Bretherton diagram' – a paradigmatic conceptual map of the 'Earth system' [Source: NASA, 1986]

Numerous scholars, most notably Hulme (2011), Beck (2011a) and Nielsen & Sejersen (2012) have critiqued the epistemic effects and implications of this framing. Numerical calculations of future changes in the climate system are placed at the start of a causal chain by which, first, climate changes and then societies experience 'impacts' to which they attempt to respond. By so doing the IPCC has arguably contributed to a form of 'climate reductionism' (Hulme 2011) which simplifies complex relationships between societies, weather and climate, and which potentially marks the re-emergence of a form of climatic determinism which positions climate as the chief determinant of human fortunes and futures. The dominance of this framing may explain some of the exclusions or overlooking of alternative knowledge systems (Bjurström & Polk 2011; Ford et al. 2011).

This reductionism is arguably most clear in the prominence which has been given to global mean surface temperature as index or icon of global change. Since the early days of climate change simulation, global mean temperature (GMT) has been the key variable of interest (as opposed, for example, to climate system energy content, radiative forcing, or global precipitation). Estimates of the equilibrium response of the climate system to a doubling of atmospheric carbon dioxide concentrations have remained remarkably stable over time (van der Sluijs et al. 1998; IPCC 2014); so too has global temperature as the organising metric of international climate politics . GMT has furnished us with targets, such as limiting global warming to 2-degrees above pre-industrial levels (Randalls 2010), while the apparent recent 'slowdown' or 'pause' in GMT rise has opened up new questions about the predictive skill of climate models, about 'natural' climate variability, and about the urgency of policy actions. At the same time, questions have been asked about whether 2-degrees can accurately be considered a threshold of 'dangerous' climate change, as critics have contested the idea that certain harmful effects of climate change can be straightforwardly correlated with GMT. It is possible, some argue, that different aspects of climate change may be 'dangerous' for certain people or physical systems well before the 2-degree GMT threshold is reached (Mahony 2014a). Our aim here is not to settle these debates; rather, we want to emphasise that in the linear, quasi-deterministic framework for understanding future climate change institutionalised in the IPCC, we can observe a powerful co-production of GMT as a way of ordering both science and politics; both models and policies are 'tuned' to the organising variable of global temperature.

We can consider this framing, or this ordering, as part of an 'institutional epistemology' of the IPCC. This institutional epistemology has effects which extend beyond the boundaries of the institution itself. The centrality of modelling to the IPCC process is reflected in the fact that the world's major climate modelling centres work to a timetable of simulation runs dictated by the Climate Model Intercomparison Project (CMIP). CMIP sets rules of experimental design and data formatting in order to deliver comparable climate model runs to the IPCC assessment process [REF needed]. Through CMIP, the IPCC shapes and structures the practice of climate modelling worldwide[1], while offering to other sections of the IPCC assessment process a touchstone variable – global mean temperature - for the organisation and presentation of arguments and projections (**Figure 2**).

[1] Indeed, we can trace this shaping back to the establishment of the IPCC in 1988, and the concurrent setting-up of the Hadley Centre for Climate Prediction and Research at the UK Met Office (Mahony & Hulme, in preparation)

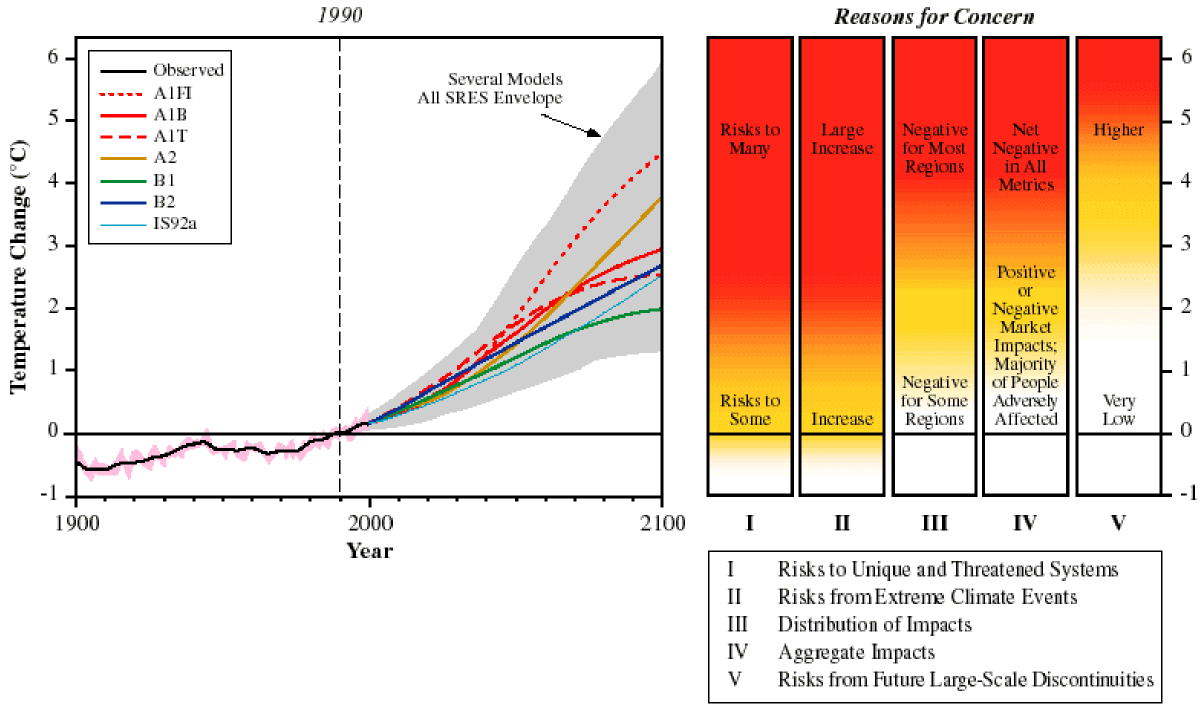

Figure 2*. Climate model projections of temperature change (left) meet the rather hazier picture of how certain 'reasons for concern' about climate change correspond with rising temperatures. From* (IPCC 2001).

3.2. A Rosetta Stone for IPBES

IPBES has been more explicit in its search for a touchstone conceptual framework by which to structure its (on-going and future) assessment activities. One of the first decisions taken by states' delegations participating in IPBES was the development of a common conceptual framework that would provide the organization with a common vision and be used across all IPBES functions:

> 'The Platform's conceptual framework is intended (…) to be a basic common ground, general and inclusive, for coordinated action towards the achievement of the ultimate goal of the Platform [i.e. Good quality of life]. Within these broad and transcultural categories, different Platform activities may identify more specific subcategories associated with knowledge systems and disciplines relevant to the task at hand, without losing view of their placement within the general conceptual framework.' (UNEP 2013:2)

A reflection on the idea of biodiversity is useful here. In its conventional scientific understanding, biodiversity represents 'all life on Earth' and includes genetic, specific and ecosystems diversity. Some global indices have been constructed to monitor, for example, species declines, such as the IUCN Red List. However the constitution of a global form of biodiversity that relies solely on mathematical modelling is arguably more complicated and, one might argue, from a normative standpoint less desirable. Some ecologists are trying to identify and develop global biodiversity indicators, such as 'Essential Biodiversity Variables' (Pereira et al. 2013). Others seek to develop global ecosystems models to simulate 'All life on Earth' (Purves et al. 2013) in a way similar to GCMs in order to improve the capacity of ecology to act as a predictive science. But such developments are by no means straightforward or uncontested. Whereas for climate change it has been possible to construct a global representation of climate change through global indicators, no equivalent global metrics exist for biodiversity and ecological processes have been described as more chaotic and less predictable (Coreau et al. 2009).

Within biodiversity and ecosystem services assessments, the formulation of a common conceptual framework was a core activity of the Millennium Assessment. Participants in this initiative articulated a common conceptual framework organized around the notion of 'ecosystem services', which was defined as 'the benefits that people gain from ecosystems' (MA 2005). With this notion, the MA contributed to a conceptualization of biodiversity issues not as a problem of biological conservation but in relation to achieving the Millennium Development Goals, hence adopting an anthropocentric framing for biodiversity (Watson 2005). The overall objective of the MA was 'human well-being' and the MA conceptual framework showed the relations between different types of services provided by ecosystems and different components of human well-being (MA 2003 ; Carpenter et al. 2009). Since this thinking has become hegemonic, some now ask whether the notion of 'ecosystem services' may provide a standardized framing, performing for biodiversity sciences and policy a role similar to the global mean temperature index for climate change (Turnhout et al. n.d.). While this may be true, in promoting this approach the MA also explicitly recognized the value of different forms of knowledge to account for the relations between 'ecosystems' and 'human well-being'. While the GBA mobilized mostly natural scientists, the MA facilitated more cross-disciplinary interactions, in particular between natural scientists and economists. IPBES aspires to develop this dialogue between diverse epistemic communities even further by including social scientists and indigenous knowledge-holders.

Within IPBES the explicit search for a unified conceptual framework can therefore be seen as an attempt to find a common 'structuring device' that would facilitate collaboration between these heterogeneous groups. At the same time it would allow some standardization in order to render possible, for example, a comparison of results of IPBES assessments in different regions. The task to initiate the framework was first handed to UNESCO in the IPBES Plenary in April 2012 (at Panama) before being passed to the members of the scientific and technical body of IPBES (i.e., the Multidisciplinary Expert Panel (MEP)) when experts for this group were first nominated in January 2013 (IPBES-1, Bonn). Although punctuated by numerous controversies (as will be explored in section 4.1), there was a willingness among IPBES members to develop the IPBES conceptual framework in a way that would be open to diverse voices and representative of diverse types of expertise and knowledges. In the two major workshops that were organized to develop the IPBES framework, efforts were made to select participants taking into consideration regional, gender and disciplinary balance while attempting to give possibilities to deliberate on the framework to other actors. For example, following the formalization of a first conceptual diagram (the 'Paris diagram'), IPBES delegations as well as members of civil society and other stakeholders were given the possibility to express their views on it. In total 27 written comments were received and made available online, these included 13 reactions by States and 12 by stakeholders.

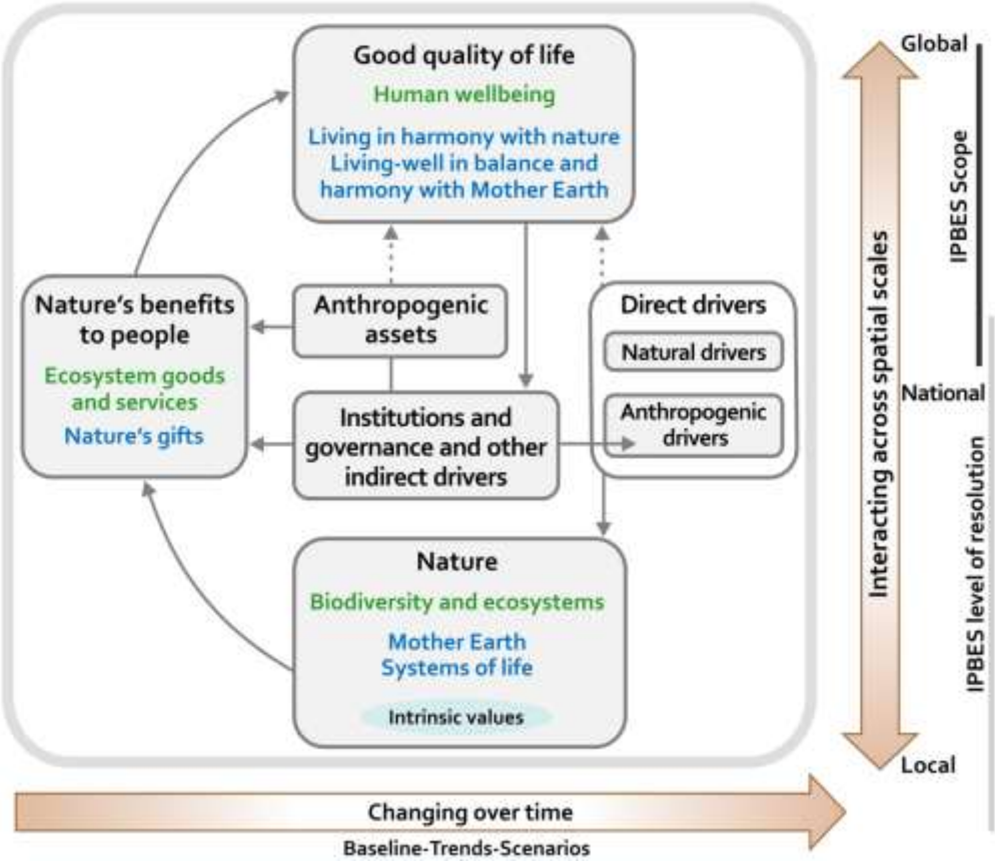

***Figure 3**. Conceptual Framework of the Intergovernmental Platform on Biodiversity and Ecosystem Services (Reproduced after Diaz et al. 2015a; 2015b, with permission from the authors).*

The final IPBES conceptual framework (**Figure 3**) aspires to bring together multiple framings of biodiversity by 'explicitly embracing different disciplines and knowledge-systems (including indigenous and local knowledge) in the co-construction of assessments' (Díaz et al. 2015:1). In particular, this framework explicitly recognizes different ways of knowing biodiversity: a utilitarian one organized around the concept of 'ecosystem services' and a more holistic one organized around the concept of 'Mother Earth'. This is made visible on the diagram by means of a colour code:

> "Text in green denotes the concepts of science; and text in blue denotes those of other knowledge-systems" (UNEP 2014:p3)

In doing so, it opens up a space for indigenous and local knowledge and, for this reason, the IPBES framework was explicitly compared to a Rosetta Stone:

> 'The CF can be thought of as a kind of "Rosetta Stone" that highlights commonalities between diverse value sets and seeks to facilitate crossdisciplinary and crosscultural understanding' (Díaz, Demissew, Joly, et al. 2015:1)

IPBES members also emphasized the innovative nature of the framework:

> 'This model clearly builds on the highly influential Millennium Ecosystem Assessment (…). However, the CF further emphasizes the crucial role of human institutions as sources of both environmental problems and solutions. … it also goes further in its intent to consider a whole range of values from monetary to spiritual and from instrumental to relational, in the valuation of nature's contribution to quality of life. Finally and crucially, the CF goes further than any previous initiative in the international environmental science–policy interface in its explicit, formal incorporation of knowledge systems other than western science, in an unprecedented effort towards crosscultural and crossdisciplinary communicability in the search for options and solutions' (Díaz et al. 2015:2)

The IPBES framework explicitly legitimates different disciplines and recognizes that more than ecological science knowledge is needed to address biodiversity-related issues. In particular, the fact that 'institutions' are placed at the core of the diagram is meant to convey an understanding of biodiversity issues as related to institutional and governance settings: the expectation is that social and political scientists have a key role to play in documenting these aspects (for example, by analysing policies and regulations that may have harmful effects on ecosystems).

In this respect, much emphasis is placed on the fact that the purpose of the 'Rosetta Stone' is for it to be used concretely in the implementation of the IPBES work programme[2]. There is a desire to use it to perform assessments at multiple temporal and spatial scales:

> 'Assessments …need coherence in their approach… The analytical conceptual framework (…) illustrates the multidisciplinarity issues to be assessed, spatially and temporally, within thematic, methodological, regional, subregional and global assessments. (…). *The conceptual framework incorporates all knowledge systems and beliefs or philosophical values*, and ensures coherence among the different assessment activities.' (IPBES 2014:46, emphasis added)

This may be interpreted as an attempt, within IPBES, to develop an institutional epistemology inclusive of diverse ontologies and different ways of 'knowing' biodiversity.

[2] As observed by an environmental philosopher participating in IPBES, there seems to be within IPBES a 'fetishism of the conceptual framework' (Interview from Jan 2015)

3.3. Scenario methodologies in the IPCC

While it can be argued that IPCC assessments of future climate change 'start' with numerical simulations of the climate system (see above), of course these simulations have to be based on estimates of how the main drivers of anthropogenic climate change will evolve over time. The IPCC evolved emissions scenario methodologies to produce "alternative images of how the future might unfold" in order to "analyse how driving forces may influence future emission outcomes" (IPCC 2000: 3). Scenarios can be understood as 'disciplined speculation' about the future (Parson 2008) and their construction demands insight from various disciplinary perspectives. As Oreskes (2015) has recently pointed out, this challenges the IPCC's self-presentation of a linear relationship between physical and social science in the assessment of climate change. The emissions scenarios used by IPCC have conventionally relied on Integrated Assessment Models (IAMs) to develop plausible trajectories of future emissions as guided by narratives of possible economic, demographic and technological change. Subsequent emissions 'pathways' are then used to simulate the transient response of the climate, before the resulting climatic scenarios are used to drive impacts studies (see IPCC 2000; Mearns et al. 2003).

Scenario methodologies can be understood as one of the ways in which IPCC has sought to bridge gaps between disciplines. The practices and language of scenario construction have become a 'creole', facilitating interaction between experts from very different epistemological traditions (Galison 1997). IPCC scenarios, such as the IS92 and the Special Reports on Emissions Scenarios (SRES) scenarios, produced for the Second and Third Assessment Reports respectively, have sequenced the practices of assessment, often with serious time lags between initial socioeconomic modelling, climate modelling and impacts modelling. For example, although the SRES scenarios shaped the presentation of climate scenarios in AR3, there was insufficient time for the impacts community to absorb the new data and much of the Working Group II assessment was based on the earlier IS92 scenarios. It took ten years from the start of work on SRES (1997) for impacts studies using the scenarios to make it into an IPCC assessment (2007). Nonetheless, the particular scenario methodologies employed by the IPCC have significantly shaped the social relations between IPCC participants, while having significant (although regrettably under-studied) effects on the wider conduct of both climate science and politics (Garb et al. 2008).

More recently, the IPCC has adopted a different approach to scenario production. Following the release of AR4, the IPCC effectively commissioned the 'research community' to produce a new set of scenarios which would short-circuit some of the sequencing problems of previous work. Rather than starting with narratives of socio-economic development, 'Representative Concentration Pathways' (RCPs) were developed using IAMs to span a range of future forcing possibilities. These concentrations and forcing pathways are not specific to any particular socio-economic scenarios. A second, and somewhat delayed, process therefore followed to construct 'Shared Socio-economic Pathways' (SSPs) to answer the question: "what are the ways in which the world could develop in order to reach a particular radiative forcing pathway?" (Moss et al. 2010: 747). In this sense, the RCP and SSP methodology has de-centred the social sciences from scenario production, returning attention to more easily quantifiable physical variables (Oreskes 2015). But the ambition has been to instigate "greater coordination" in order to "facilitate additional scientific advances, including increased understanding of different types of feedbacks and improved synthesis of research on adaptation, mitigation and damages incurred" (Moss et al. 2010: 751). With the heavy use of the RCP scenarios in IPCC AR5 (rather less so the SSPs) we can again see the influence of a particular, institutionalised epistemology both on the production of a large, multidisciplinary and international assessment, and on the scientific community more broadly.

3.4 Circulating knowledge-practices? Use of scenarios in the MA and in IPBES

As in the case of the IPCC, scenarios have also become a core activity in the conduct of biodiversity and ecosystem services assessments where much emphasis is placed on the ability of these tools to illuminate possible futures while identifying potential policy options. The MA was organized among four working groups, including a 'Scenario Working Group' inclusive of both natural and social scientists. The focus of this Group was on the development of different scenarios showing the evolution of the relations between 'human well-being' and 'ecosystem services' according to different governance and economic pathways. The definition of scenarios was imported from the IPCC and defined in the MA as: 'plausible and often simplified descriptions of how the future may develop based on a coherent and internally consistent set of assumptions about key driving forces and relationships.' (MA 2010: 153).

In terms of methodological approach, the MA scenarios qualify as exploratory in the sense that the starting point was the present moment. They were developed using a mix of both quantitative and qualitative techniques and their respective storylines resonate to a certain extent with the IPCC SRES scenarios (see Table 2). Both sets of scenarios emerge from a matrix organized around two axes, in the MA case a vertical axis showing the 'extent to which the world is globalized vs. regionalized' and a horizontal axis showing 'the extent to which ecosystem management is either reactive (responding to ecosystem problems after they occur) or proactive (deliberately seeking to manage ecosystem services in sustainable ways)'(Carpenter et al. 2006). However, although the storylines of the MA and IPCC share some similarities, the MA storyline development was guided by a different methodology, reflecting a more participatory 'epistemic culture' in the delineation of 'policy-relevant' knowledge.

Table 1 Scenarios in the IPCC and the MA

IPCC-SRES **Horizon 2100**	**MA** **Horizon 2100**
A1: Rapid market-driven growth, with convergence in incomes and culture; rapid technological change **A2**: Self-reliance and preservation of local identities; fragmented development **B1**: Similar to A1, but emphasizes global solutions to sustainability, relying heavily on technology **B2**: Local technological and policy solutions to economic, social and environmental sustainability	**Global orchestration**: a globally connected world with well-developed global markets and supranational institutions to deal with global environmental problems and inequity **Order of strength**: a fragmented world concerned with security and protection of regional markets and with little attention for common goods **Adapting mosaic**: A fragmented world resulting from discredited global institutions leads to the rise of local and regional initiatives supporting common goods **TechnoGarden**: A globally connected world relying strongly on technology, also for solving environmental problems and global inequity.

Adapted from Rounsevell & Metzger 2010, p618

The MA scenarios[3] were developed in conjunction with the intended users of the assessments (as stated by the MA: 'the MA Board represents the users'). Participants in the Scenario Working Group attempted to conduct their work in close cooperation with these targeted users, which included representatives of national governments, multilateral environmental agreements (e.g. CBD, Convention on Desertification) and the private sector (Bennett et al. 2005). This meant that in terms of social organisation, scenarios were also approached as an opportunity to develop new forms of collaborations:

> 'Scientific assessments are most helpful to decision-makers when the intended users are active in the assessment process and, especially, when the users directly help shape

[3] Another feature of the scenarios of the MA is that, although they were first designed as 'global', they were also used at sub-regional scales, such as in South Africa (Biggs et al. 2008).

> the questions that the assessment will answer. To that end, the MA team interviewed 59 leaders in NGOs, governments, and industry, from five continents to find out their concerns about the next 50 years. We chose leaders from many sectors and nations to gain access to a wide range of concerns and responses. (…). We believed that the scenarios should embrace the diversity of viewpoints held by the interviewees. By organizing diverse viewpoints in scenarios, we hoped to facilitate debate and discussion. (…) We identified four clusters, and developed coherent stories that represented beliefs about the future represented by each cluster.' (Carpenter et al 2009:2)

IPBES also intends to develop scenarios and a working group on 'policy support tools' has been established. In this context it is anticipated that IPBES scenarios will be developed using a variety of techniques including new 'experimental' techniques. In particular, there is a willingness to develop 'backcasting' techniques where the scenarios are developed according to particular policy objectives (e.g. Aichi Targets) and then potential pathways to reach these policy objectives are inferred. While such approach, as in the IPCC's RCPs and SSPs, is quite normative, IPBES' authors also emphasize that:

> 'To improve the involvement of decision makers and a variety of knowledge holders in the process, there will be a focus on participatory methods, "Backcasting" methods that work backwards from agreed-upon future goals and other methods that reinforce the science-policy and science-stakeholder dialogue.' (IPBES/2/16/Add.4)

This can perhaps be interpreted as reflecting, within IPBES, an attempt to make room for diverse epistemic practices while creating opportunities for deliberation between diverse social worlds.

4. Argumentation and consensus

Both IPBES and IPCC aspire to be globally credible – bridging cultural and geographical diversity – while being simultaneously accountable to the worlds of science and policy. In this context *consensus* has gained great prominence – both in the practices of international knowledge making and in the decision-making processes of these institutions. In this section we focus on how IPBES and IPCC have sought to handle conflicting views and disagreements. In so doing, we seek to begin a line of inquiry into the nature of consensus and consensus-making practices in GEAs, responding to Harry Collins' provocative claim that, in epistemological, sociological and political senses, "we don't really know what scientific consensus is" (quoted in Jomisko 2013: 28).

4.1. IPCC: value of life and sea-level rise controversies

Since its establishment, the IPCC has been through several controversies and consequent reforms, resulting in major changes in its procedures in 1993, 1999 and 2010. Particular moments of contestation can be read as struggles over the nature and practice of consensus-building, in a context where universal metrics are sought for a set of phenomena with complex and contested normative contours. In the IPCC Second Assessment Report, controversy arose over the economic valuation of human lives in estimates of climate impacts. Governments such as India objected to valuations in the Summary for Policymakers which suggested that OECD lives were more valuable than human lives in developing countries. Authors of the underlying chapter argued that it would be wrong to subvert accepted economic methodologies for constructing monetized estimates of loss. Yet IPCC author Michael Grubb would later argue that:

> 'Many of us think that the governments were basically right. The metric makes sense for determining how a given government might make trade-offs between its own internal projects. But the same logic fails when the issue is one of damage inflicted by some countries on others: why should the deaths inflicted by the big emitters — principally the industrialised countries — be valued differently according to the wealth of the victims' countries?' (Grubb 2005: xx).

This statement illustrates some of the ambiguities of consensus-making in intergovernmental settings like the IPCC. Established methodologies for measuring national economic projects can be stabilised in assessment processes, where both new forms of knowledge and new forms of political order are being co-produced. New metrics produce new ways of governing, and vice-versa, and thus the antagonism through which new political orders emerge permeates into questions of statistical representation and aggregation[4].

In response to controversies such as this the IPCC has developed mechanisms for dealing with disagreement. In SPM deliberations, dissenting government delegates can be taken aside by relevant authors to be persuaded to accept the dominant way of thinking. The IPCC even has the capacity for issuing formal 'minority reports', although this procedure has not yet been utilised. Techniques like the issuing of uncertainty guidelines attempt to codify representations of divergent opinions, while conflicting 'expert judgments' can also be informally represented in diagrams such as **Figure 1**.

[4] This controversy echoed an earlier debate triggered by Indian environmental analysts who contested universalising metrics of greenhouse gas emissions, suggesting instead distinctions between 'luxury' and 'survival' emissions. See (Mahony 2014b)

Yet among observers and participants of the IPCC, there are ambiguities about whether consensus statements reflect "a lowest common denominator consensus view of the vast majority of scientists" (Edwards & Schneider 1997: 13), or whether the IPCC "*brings controversy within consensus*, capturing the full range of expert opinion" (Edwards 2010: xvii, emphasis in original). This ambiguity about whether producing consensus is about capturing the 'full range' of opinion, or the 'lowest common denominator' that everyone can agree on, has played out in further public controversies, for example the controversy over IPCC estimates of future sea level rise (O'Reilly et al. 2012). James Hansen argued that the IPCC's sea level rise projections in 2007 were troublingly conservative, as the need for consensus meant that emerging, uncertain work on ice sheet dynamics was discounted. Hansen painted the consensus projections as a lowest common denominator, identifying 'scientific reticence' in the avoidance of exploring more extreme possibilities (Hansen 2007). For Oppenheimer et al. (2007: 1506) the need for potentially consequential information in the 'tails' of probability distributions means the "establishment of consensus by the IPCC is no longer as critical to governments as a full exploration of uncertainty".

We suggest that far from 'bringing controversy within consensus', the IPCC process displaces controversy to the assessments' outsides, where very public controversies sporadically flare up over the epistemic and normative content of IPCC reports[5]. The IPCC's pursuit of consensus is the result of a constitutional settlement which places 'sound science' at the start of a chain reaction of sure knowledge and determined action (Miller 2009). The assumption that assessments must be consensual to be authoritative is debatable however (Hulme 2013), and we might speculate whether an assessment which more readily represented disagreement explicitly might more effectively perform the bridging functions which we identified earlier on (local/global; science/policy).

4.2. Consensus and dissensus in IPBES

By returning to the 'Rosetta Stone' developed by IPBES we can develop a comparative account of consensus and argumentation to that of the IPCC. The process leading to the formalization of the IPBES framework was punctuated by numerous controversies and the diagram underwent numerous metamorphoses (see **Figure 4)**. Before the adoption of the final IPBES framework, a first version (The Paris diagram) – the outcome of an early expert workshop – was presented to IPBES delegations and observers. While relatively well received by some delegations, this first diagram was also vehemently contested. The Paris diagram was composed of four boxes connected with arrows showing the relations between 'ecosystem services', 'biodiversity', 'institutions' with the overall objective being 'human well-being'. This initial framing resonated with the framework of the Millennium Ecosystem

[5] Other examples could be cited – for example, controversy about the detection and attribution statement in IPCC AR2 WGI in 1996 or about economic damages of climate change in IPCC AR5 WGIII in 2014.

Assessment, except that it placed 'institutions' at its core in an attempt to underline the importance of socio-institutional settings to address biodiversity-related issues.

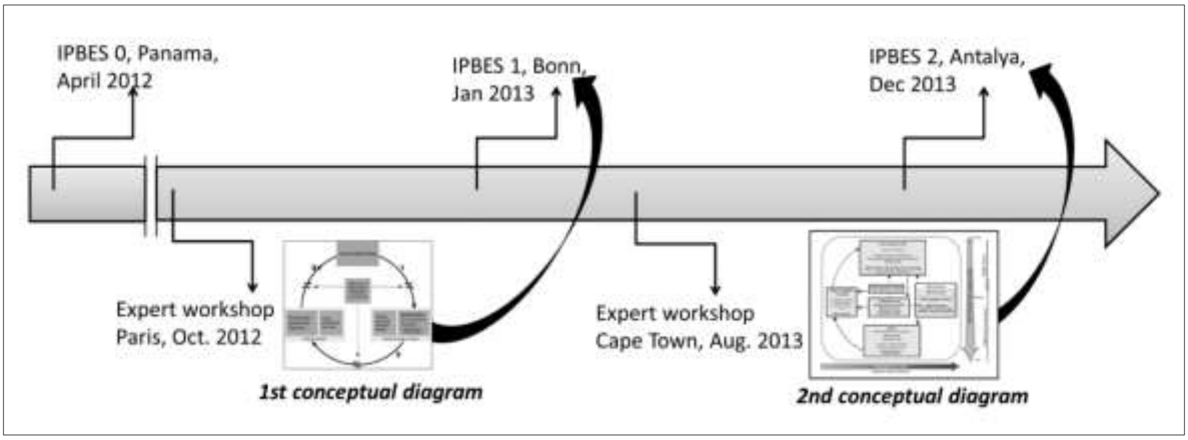

Figure 4. *Chronology of main events punctuating the development of the IPBES conceptual framework, April 2012 to December 2013. (Source: Borie & Hulme 2015:nd)*

At the core of heated debates was the notion of 'ecosystem services'. Those participating in the development of the IPBES framework held a wide array of positions regarding this concept and a strong polarization emerged between those wishing to maintain and promote it further and those strongly advocating against. Many scientists who had already been involved in the MA were supportive of the ecosystem services approach and argued that it was important to preserve some epistemic continuity with this previous initiative. Here, 'ecosystem services' were defended as the most pragmatic approach to make environmental concerns relevant to policy and decision-makers (allowing, for example, to develop ecosystem services valuation practices). In contrast, some participants strongly rejected the concept and advocated for alternative framings. In particular, the Bolivian delegation argued that the notion of 'ecosystem services' was representative of a western, neoliberal, approach to biodiversity and that such a framing was associated with performative effects, potentially leading to the commodification of nature. Contesting the Paris diagram, the Bolivian delegation put forward an alternative framework articulated around the notion of 'Mother Earth' which was explicitly aimed at opening-up a space for other ways of knowing, in particular for indigenous and local knowledges (Bolivia 2013).

IPBES is an intergovernmental institution and, as is the case with many United Nations processes, the main decision-making mode is consensus. Despite the disagreements expressed above, there was a willingness amongst participants to adopt a single conceptual framework and to find an agreement between diverging views. Despite this intention a consensual agreement over a single framing or common terminology was elusive. As we have argued elsewhere:

> This absence of convergence – the lack of an agreement over a singular framing – is illustrated by the very fact that a colour coding device was deemed necessary. The controversy between Mother Earth and ecosystem services experts can be understood as resulting from efforts by these two groups to constitute their own framing with what perhaps bears some similarity with an *obligatory passage point* (Callon 1986). Each group refuses to give up its framing for the same reason: they are each perceived as too political by the other group. In this respect, the colour coding device – blue for Mother Earth, green for ecosystem services – appears as a solution to create an agreement out of disagreement, to create a consensus out of dissensus (Borie & Hulme 2015:9)

Through the use of a colour code, both the 'ecosystem services and 'Mother Earth' perspectives were recognized. To some extent this can be interpreted as reflecting the idea that participants 'agreed to disagree'. This solution was perceived by some participants as being successful, a smart way of articulating diverging views and conflating them in a single diagram. As summarized provocatively by one ecologist (a member of the MEP): 'Christians would say God, Muslims would say Allah'. Although there is no obvious commensurability between 'Mother Earth' and 'ecosystem services', the adopted solution nonetheless suggests that the role of consensus in decision-making within IPBES has perhaps facilitated the integration of what could be perceived as a 'minority position'. According to one ecologist involved in this task:

> 'It was that very powerful set of interventions from the Bolivians that really re-framed it and [she] had many discussions with South American delegates involved in IPBES.' *(Ecologist, participant in Paris and Cape Town workshops)*

Mother Earth was predominantly promoted by the Bolivian delegation, with support from some other South American countries, but was often perceived as a marginal position among IPBES participants. We might therefore say that, whereas the IPCC displaced epistemic controversy into the wider, external cultural circuits of climate change politics, IPBES has sought to use consensus as a way of gathering together disparate ontological and epistemological commitments, to 'bring controversy within consensus'.

5. Discussion-Conclusion

As GEAs have become prominent actors in the field of global environmental governance, they have also faced numerous contestations, in particular for being dominated by Northern experts and adopting reductionist framings of 'global environmental change'. Following a first generation of 'top-down' GEAs initiated in the late 1980s and dominated by elite scientific networks, most recent GEAs have attempted to respond to these critics and adopted different approaches, for example being alert to the place-based affiliations of participating experts. The IPCC is an example of a 'top-down', predominantly science-driven GEA. Its organization contrasts with most recent GEAs such as the Millennium Ecosystem Assessment and the International Assessment on the State of Agricultural Knowledge for Technology and Development which have attempted to engage with a broader range of actors and knowledges, while conducting assessments at multiple scales. The IPCC is also repeatedly trying to reform itself, for example by changing the rules on the admission of 'grey literature' into assessments in a bid to access knowledge which resides outside of conventional scientific institutions. While IPBES shares a number of similarities with the IPCC, it also aspires to further 'open-up' towards diverse types of knowledges and expertise while ensuring a geographical balance between experts.

Historically speaking, the IPCC may be said to have sought a 'view from nowhere'. Despite its own efforts at geographical balance, the emphasis has been on the physical sciences in which expertise resides predominantly in western countries. Complex numerical modelling has dominated the construction of future climates, while the drive for consensus has urged science to 'speak with one voice' – a voice which is to be disinterested, disembodied and set apart from politics. In contrast, IPBES and its drive to gather together diverse ontological and epistemological commitments within a singular conceptual framework has so far sought something more like a 'view from everywhere'. Yet despite these divergent aspirations, both organisations in fact cannot escape offering 'views from somewhere' – situated sets of knowledge marked by politico-epistemic struggles and by the interests, priorities and voices of certain powerful actors. Both operate in intergovernmental settings and are owned by governments.

In this respect, the possibility for IPBES to adopt an 'innovative' framework also relates to the fact that IPBES is dominated by a consensus-driven mode of decision-making and that the contestation over 'ecosystem services' found support among government delegations. (One can speculate whether the IPBES framework would have been very different from the one adopted in the MA if there had been an absence of vehement contestation by representatives of certain states). In adopting this innovative framework, IPBES also essentialized the distinction between science and indigenous and local knowledge (ILK), reifying them as two distinct monolithic categories; on the one hand is 'science' as the 'view from nowhere' and on the other 'ILK' which serves to conflate all knowledge that is not 'free from local coloration' (Jasanoff & Martello 2004:13). Moreover, while IPBES aspires to 'open-up' expertise by achieving regional, gender and disciplinary balance in all its working groups, the analysis of the composition of the scientific and technical body of IPBES suggests that to date this group of experts remains highly skewed towards male natural scientists (Montana & Borie 2015).

We suggest that characterizing these respective 'views from somewhere' may benefit from the development of the concept of *institutional epistemology*. Jasanoff (2005) developed the notion of civic epistemology to describe particular culturally-embedded forms of public knowledge-making which can be identified in different national contexts. While some efforts have been made to apply the concept to bodies like the IPCC (Jasanoff 2011; Mahony 2014a), we suggest that the international, intergovernmental nature of GEAs demands some conceptual rethinking. We might ask, how do particular forms of reasoning come to the fore in different GEA processes? How and why do these forms persist over time? And what effects do these epistemologies have on wider scientific practices? We suggest that consensus, argumentation, authoritative conceptual frameworks, modes of 'futuring', strategies of coordination and forms of participation are useful 'variables' with which to begin a comparative account of institutional epistemologies across diverse GEAs (Table 2).

A complementary line of inquiry might then explore the relations between different institutional epistemologies and how they mutually influence each other. For example, the aspiration to develop global models in ecology is inspired, at least partially, by climate sciences and the IPCC:

> 'No report from the IPCC would fail to mention global climate models. (…) We think that analogous general ecosystem models (GEMs) could radically improve our understanding of the biosphere and inform policy decisions about biodiversity and conservation' (Purves et al 2013:295)

Similarly, the work on scenarios in both the MA and IPBES represents a particular 'mode of futuring' which has arguably been highly influenced by the knowledge practices in use in the IPCC. Studying these situated practices may help understand how particular ways of knowing are rendered authoritative and institutionalized, and also how they gain mobility and influence between different GEA processes.

Table 2. A sketch of some elements of 'institutional epistemology', not all of which we have been able to explore in this paper

	IPCC	IPBES
Consensus	Science speaking with one voice; lowest common denominator	Aim to incorporate divergent ontologies and epistemologies within consensus positions

Argumentation	Reviewer and government objections, persuasion, [minority reports not used]	Reviewer and government objections, willingness to do minority reporting
Conceptual frameworks	Implicit; globalism; Bretherton diagram; linear model & disciplinary hierarchy	Explicit with parallel ontologies; 'Rosetta Stone' ; multi-scalar approach; inclusivity
Modes of futuring	Scenario and pathway analysis to serve the needs of climate models	Scenarios and modelling; willingness to develop 'backcast' and participatory techniques
Participation	Biased towards global North and quantitative sciences despite efforts to the contrary to ensure 'global credibility'	Seeking geographic, disciplinary, and cultural diversity
Assumptions regarding valid knowledge	Peer-reviewed material	Peer-reviewed material and grey literature
Strategies of coordination/harmonisation	Uncertainty guidelines; scenario methodologies; cross-cutting Boxes (e.g. on gender)	Explicit conceptual framework; guidelines to facilitate synergies between 'science' and 'ILK'

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