JIRD

Boundary organizations in regime complexes: a social network profile of IPBES

Jean-Frédéric Morin[a,*], Sélim Louafi[a], Amandine Orsini[a] and Mohamed Oubenal[a]

[a]Political Science Department, Université Laval, Pavillon Charles-De-Koninck, bur. 4445, 1030 avenue des Sciences Humaines, Québec, QC G1V 0A6, Canada.
E-mail: jean-frederic.morin@pol.ulaval.ca

*Corresponding author.

Abstract Regime complexes are arrays of institutions with partially overlapping mandates and memberships. As tensions frequently arise among these institutions, there is a growing interest geared to finding strategies to reduce them. Insights from regime theory, science and technology studies, and social network analysis support the claim that "boundary organizations"—a type of organization until now overlooked in International Relations—can reduce tensions within regime complexes by generating credible, legitimate, and salient knowledge, provided that their internal networks balance multiple knowledge dimensions. Building on this argument, this article offers an *ex ante* assessment of the recently created International Platform on Biodiversity and Ecosystem Services (IPBES). Results from our network analysis of IPBES point to clear improvements compared with similar organizations, although major deficiencies remain. The contribution of this article is threefold. Methodologically, it introduces new conceptual and technical tools to assess the "social representativeness" of international organizations. Theoretically, it supports the claim that international organizations are penetrated by transnational networks and, consequently, that the proliferation of institutions tends to reproduce structural imbalances. Normatively, it argues that a revision of nomination processes could improve the ability of boundary organizations to generate salient, credible, and legitimate knowledge.
Journal of International Relations and Development (2016).
doi:10.1057/s41268-016-0006-8

Keywords: international institutions; regime complex; boundary organization; biodiversity; social network analysis; IPBES

As tensions frequently arise between international institutions, there is a growing interest in International Relations (IR) for regime complex governance. Regime complexes are arrays of regimes with partially overlapping mandates and memberships (Raustiala and Victor 2004; Morin and Orsini 2014). Each elemental regime is autonomous, but they are all interdependent. Since they are not centrally coordinated, tensions frequently arise in the form of legal inconsistencies, policy incoherencies, negative spillovers, bureaucratic rivalries, and norm confusions.

Insights from Science and Technology Studies (S&TS) support the view that knowledge management can positively contribute to regime complex governance. In particular, "boundary organizations" — a type of organization so far overlooked in IR — can contribute to the creation of shared knowledge across regimes and, by doing so, can reduce the risk of tensions among them.

Yet, this capacity of boundary organizations to reduce tensions within regime complexes is not automatic. Regime complexes are not mechanical devices that can be smoothed simply by lubricating their component parts. Rather, regime complexes are social environments and, as such, social relations constitute and penetrate their elemental regimes. As David Lazer rightly notes, IR "has the ironic distinction of being the subfield of political science that includes 'relations' in its name and yet, historically, has rarely used the analytic tools of network methods" (2011: 63).

This article contributes to the growing literature in IR that uses Social Network Analysis (SNA) to highlight the social and relational dimensions of international institutions (Hafner-Burton *et al.* 2009). More specifically, we introduce the concept of "social representativeness," defined as the capacity of actors to create dense relationships inside groups with the same attributes and create bridging ties with groups having different characteristics. We argue that for a boundary organization to reduce tensions between regimes, its members should be "socially representative" of the various knowledge dimensions found in the regime complex.

Building on this benchmark, the article aims at assessing the capacity of the recently created International Platform on Biodiversity and Ecosystem Services (IPBES) to improve the management of the biodiversity regime complex. According to its mandate, one of the aims of IPBES is to "address the needs of Multilateral Environmental Agreements that are related to biodiversity and ecosystem services, and build on existing processes ensuring synergy and complementarities in each other's work" (www.ipbes.net). On this basis, this article assesses the capacity of IPBES to live up to its ambitions and improve the governance of the biodiversity complex. The assessment is based on a network analysis of the individual members of the IPBES Panel and Bureau, taking into account the social representativeness of the various issue-areas, scales, and epistemologies of the biodiversity regime complex.

This article is divided into five parts. The first section reviews the literature supporting the claim that a balanced and socially representative boundary organization can improve the management of a regime complex by generating shared knowledge. The second section introduces the biodiversity complex and presents IPBES. The third section describes the method used to analyze the network of IPBES Panel and Bureau members. The fourth section presents the results and identifies gaps in the representativeness in the IPBES network. The last part discusses the implications of the study for further research in IR and international political economy.

Theoretical argument

Although regime complex theory is still at an early stage of its development, it is growing exponentially. Its appeal arises from the recognition that regimes are not created in an institutional vacuum and do not develop in isolation from other institutions, as initially assumed by several early regime theory scholars. Building on this insight, numerous cases of regime complexes have been documented in every field of world politics.

In its decade of existence, this bourgeoning literature has found that regime complexes have at least two dimensions when observed at a given point in time. The first dimension is horizontal and concerns thematic overlaps among the regimes within a given complex. Several taxonomies have been suggested to describe these horizontal interactions in order to distinguish utilitarian, normative, and ideational interplays (Stokke 2001); compatible and diverging overlaps (Rosendal 2001); disruptive, synergistic, and neutral interactions (Gehring and Oberthür 2009); and cooperative and conflicting fragmentation (Biermann *et al.* 2009). Irrespective of their preferred taxonomy, most authors readily accept that these horizontal interactions are partly socially constructed. For example, there was a radical shift in the horizontal interactions between trade and intellectual property regimes in the 1980s when certain stakeholders suggested that intellectual property protection actually contributed to international trade rather than obstructing it (Muzaka 2011). Thus, various actors, including intergovernmental secretariats and nonstate actors, seek to frame horizontal interactions in the context of their perceived interests.

The second recognized dimension of regime complexes is vertical and concerns scale overlaps, as regimes vary in size, level, and membership (Young 2006). While some "nested regimes" are as neatly organized as Russian dolls and function according to a bottom-up or top-down logic, several vertical overlaps are conflictual (Young 1996). One classic example of problematic vertical overlaps is manifest in the alleged friction that exists between the multilateral World Trade Organization and bilateral trade agreements (Davis 2009). Across the various layers, transnational institutions, such as public–private partnerships, add to the intricacy of the regime complexes (Morse and Keohane 2014).

These institutional horizontal and vertical interactions have mixed consequences for global governance. On the one hand, overlaps could generate confusion, redundancy, and inefficiency (Biermann *et al.* 2009; Kelley 2009). The presence of various competing institutions can also strengthen the already powerful actors in their forum-shopping strategy and exacerbate existing power imbalances (Benvenisti and Downs 2007; Drezner 2009). On the other hand, institutional diversity and competition can favor a more flexible, adaptive, and innovative form of governance (Keohane and Victor 2011; Johnson and Urpelainen 2012; Kellow 2012). According to organizational ecology theory (Abbott *et al.* 2015; Gehring and Faude 2014) and complex system theory (Kim and Mackey 2014), competing institutions are under pressure to specialize in a given niche or to innovate. In this way, institutions adapt continually, and those best suited to their environment thrive.

Given these mixed effects, there is a growing consensus that regime complexes should be purposefully managed. Regime complex management is defined as the "conscious efforts by any relevant actor or group of actors, in whatever form or forum, to address and improve institutional interaction and its effects" (Oberthür and Stokke 2011: 6). This purposeful improvement, however, raises a classic dilemma in the neoinstitutional literature: how can the risks of wasteful inefficiency and unfair opportunistic behavior be minimized without damaging diversity and competition deemed necessary for adaptability? An approach using hierarchical and centralized regulatory coordination can reduce redundancies and create a level playing field, but it could also simultaneously decrease the potential for adaptation (Rammel *et al.* 2007; Duit and Galaz 2008). Against this backdrop, several authors have argued for flexible and polycentric modes of governance in regime complexes, such as "non-hierarchical orchestration" (Abbott and Snidal 2010; Abbott 2012), "cooperative arrangements" (Scott 2011) or public–private partnerships (Green 2013; Visseren-Hamakers *et al.* 2011). However, precisely how to apply and promote this flexible governance in practice has so far remained unclear.

Looking at the literature on S&TS, we find that knowledge management constitutes a promising approach to improving cooperation among the different components of a regime complex and to reducing the risk of tensions (Oberthür 2009). Regimes are social institutions that develop and evolve around knowledge (Haas 1980). When considered endogenous to the policy process, knowledge plays several crucial roles, from justification to learning (Radaelli 1995). However, different regimes, focusing on different issue-areas and operating at different scales do not share the same body of knowledge, and as a result vertical and horizontal tensions in regime complexes often occur because of knowledge divergence. Yet if actors of different regimes can be brought together to interact, share information and produce knowledge together, improvements in institutional interactions could develop (Olsson *et al.* 2004; Martello 2004; Berkes 2009; Lebel *et al.* 2010; Gupta *et al.* 2015). Regimes that are part of a complex would then be involved in "inter-institutional learning" (Oberthür 2009; Young 2010), and stakeholders from different scales and issue-areas would be involved in "social learning" (Lebel *et al.* 2010). Both of these processes can positively contribute to regime complex governance by favoring the constant adaptation of institutions to their changing social and institutional environment.

In order to conceptualize how this type of learning could be brought about, we borrow and adapt the concept of "boundary" from S&TS (Miller 2001; Lidskog and Sundqvist 2015). This concept was originally coined to refer to the unstable demarcations that scientists establish and maintain to distinguish science from politics, ideology, religion, and pseudoscience (Gieryn 1983). In S&TS, "boundary organizations" are forums where actors from all sides of the science/nonscience divide can interact, communicate, and translate their respective knowledge, as well as build joint knowledge that is perceived as credible, legitimate, and salient, while remaining accountable to their original social arena (Guston 2001; Cash *et al.* 2003). Within a boundary organization, actors engage in various forms of knowledge brokering activities, including informing, consulting, matchmaking, engaging, collaborating, and capacity building (Michaels 2009). These activities, also known as "boundary work," help to reduce tensions that often arise between actors who do not share the same knowledge systems (scientific vs nonscientific). As a result, mutual understanding can be reached while preserving the boundaries that remain necessary to clarify each other's role.

A similar logic could be applied to regime complex governance: while flexible borders between different issue-areas and scales should be maintained so that a complex remains adaptable, knowledge should flow freely in order to improve the institutional interactions. For this purpose, a "boundary organization" can improve the governance of a regime complex by creating and diffusing shared knowledge seen as credible, legitimate, and salient for each element regime. By enabling multiple flows of information, boundary organizations are likely to facilitate interinstitutional and social learning and generate knowledge that is perceived as credible, legitimate, and salient by all stakeholders (Cash *et al.* 2003).

Irrespective of their formal mandate, the capacity of boundary organizations to actually conduct boundary work varies according to several conditions, including their institutional design and the selection of their members. One of the prerequisites for a boundary organization to succeed in generating knowledge seen as credible, legitimate, and salient is the representativeness of the various elements of the complex within the boundary organization itself. In this article, we consider several dimensions of representativeness from a knowledge perspective.

Representativeness in boundary organizations is usually understood in two complementary ways. First, scientists and policymakers should jointly participate and interact in boundary organizations. This joint involvement is considered necessary so that science can build on politically arbitrated values, and politics can rely on scientifically arbitrated information (Jasanoff 1996). Studies have found that the IPCC credibility crisis partly results from its conceptualization of policymakers as downstream clients, rather than upstream coproducers of knowledge (Beck 2011; Lidskog and Sundqvist 2015). Second, various disciplines should be represented in boundary organizations. Social sciences, in particular, complement natural sciences by favoring a reflexive and selfcritical process and by minimizing the risks of groupthink and overly confident claims (Lemos and Morehouse 2005). Some argue that IPCC social salience suffers from its bias in favor of natural sciences and its organization into disciplinary silos (Bjurström and Polk 2011).

While these epistemological dimensions are useful, representativeness should not necessarily be limited to professions and disciplines. As far as regime complexes are concerned, elemental regimes should also be represented in the boundary organization, and participants representing various issue-areas and scales need to directly interact within such boundary organizations (Cash *et al.* 2006; Koetz *et al.* 2012). To this end, boundary organizations can usefully integrate actors with transthematic and transcalar expertise to act as knowledge brokers (Clark *et al.* 2010).

Moreover, we suggest that the criteria of "numerical representativeness," *i.e.,* the numerical ratio of experts on a given issue-area, scale, and epistemology to the total number of experts constituting the boundary organization, is insufficient to assess representativeness. Following a growing literature looking at how international organizations are penetrated by transnational networks of professionals (Seabrooke 2014; Stone 2013), we recognize that the group of experts that constitute a boundary organization does not operate in a social vacuum. Not only do they have various prior experiences, but some of them had previous interactions outside the boundary organization (Crona and Parker 2011). This is likely to be the case even for boundary organizations at the center of large regime complexes, since the multiplication of international venues and thus of opportunities for interactions often create a "small group environment" (Alter and Meunier 2009: 18). For this reason, we argue that it is important to consider the social capital (Coleman 1988) of participants in order to assess a boundary organization. For example, a boundary organization that aims to bring together knowledge from the economics of waste management, soil contamination, human health, and transport logistics should not only ensure that some of the participants have knowledge of these various issue-areas, but also that they are socially connected with participants holding different expertises in a balanced manner. Thus, the criteria of "numerical representativeness" should be enhanced by the criteria of "social representativeness," *i.e.*, the degree of integration in the social relations of the group of experts that constitute the given boundary organization.

Social network analysis renders the distinction between numerical and social representativeness visible. Obtaining, communicating. and generating knowledge largely depend on one's position within a social network (Hafner-Burton *et al.* 2009). In the parlance of SNA, a boundary organization that aspires to generate credible, legitimate, and salient knowledge for a regime complex requires both external "bridging ties," which connect it with various issue-areas, scales, and epistemologies, as well as internal "bonding ties" (Coleman 1988) to create a dense, balanced, and cohesive group (see Figure 1).

A regime complex is in itself a network of various institutions (Böhmelt and Spilker 2015). However, a boundary organization with the objective of sharing and

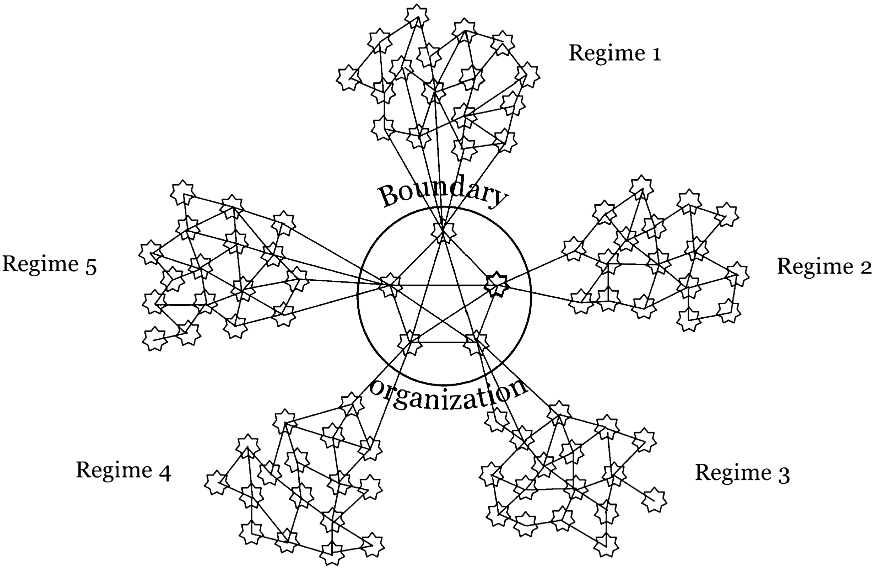


Figure 1 Network conceptualization of a boundary organization at the center of a regime complex.

building knowledge should not simply constitute a miniature version of the larger complex, boiled down at the human level but reproducing the same structural deficiencies. Otherwise, it might marginalize the already marginalized regimes, or increase the influence of already well-connected stakeholders (Alter and Meunier 2009: 9). In turn, this could raise criticisms and undermine the credibility, legitimacy, and salience of the knowledge, destabilizing the regime complex altogether and jeopardizing its adaptation to a changing environment. Thus, this literature review leads us to conclude that, in order to minimize this risk and avoid this bias, a boundary organization's internal network should be socially representative of the various issue-areas, scales, and epistemologies of its regime complex.

The biodiversity regime complex

The biodiversity complex includes a multiplicity of institutions, actors, and ideas, some compatible but others antagonistic (Koetz *et al.* 2012). At least five interconnected elemental issue-areas have been identified in the literature as the different facets of global biodiversity governance (Rosendal 2001; Le Prestre 2002; Swanson and Groom 2012; Brand and Görg 2013; Morin and Orsini 2014). Each regime that is part of the complex emerged over time, promoted by different actors and embodied in different institutions. No regime is homogeneous and free from internal controversies, but each is organized around consensual background knowledge, including some unchallenged norms and principles. The intersection of the five identified regimes form the biodiversity regime complex presented in Figure 2.

Environmental protection is the first and central issue-area of the biodiversity complex. Players active in this issue-area include environmental NGOs driven by preservationist concerns for wildlife, such as the Sierra Club, academic societies eager to generate, communicate, and implement scientific knowledge, such as the Society for Conservation Biology, and organizations that aim to better integrate societies with their natural environment, such as Conservation International. As a result of the advocacy of these various stakeholders, numerous local, regional, transnational, and international initiatives dedicated to biological diversity protection have been adopted. Some multilateral agreements focus on specific species, such as the 1946 Convention on Whaling and the 1979 Bonn Convention

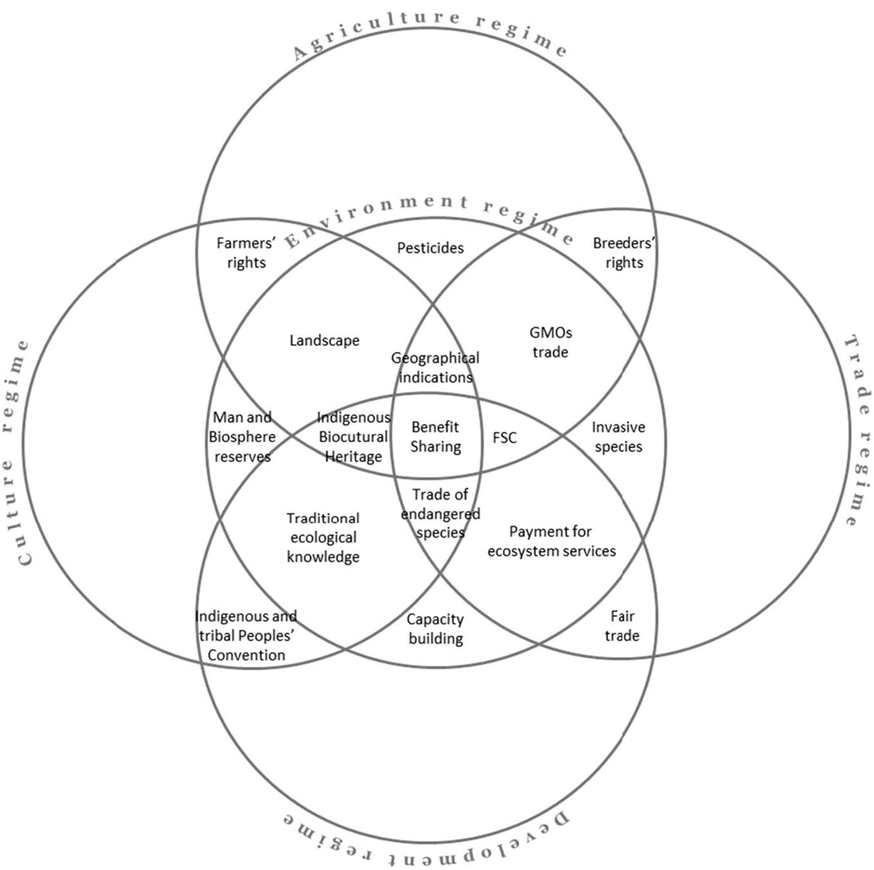


Figure 2 The biodiversity complex.

on the Conservation of Migratory Species. Others seek to protect specific areas or ecosystems, such as the 1971 Ramsar Convention on Wetlands and the 1991 Madrid Protocol on the Antarctic.

The second issue-area that constitutes the biodiversity complex is agriculture. As early as the 1960s, groups of scientists and farmers expressed concerns about the risks of genetic erosion caused by the increased use of genetically uniform varieties in agriculture (Andersen 2008). They emphasized the importance of genetic diversity as the building block of any agricultural production system (Gepts 2006). Since then, the objectives of conservation and the sustainable use of agricultural diversity have been included on the agenda of international organizations, notably the FAO and transnational initiatives such as the Consultative Group of International Agricultural Research (CGIAR) (Andersen 2008; Clark *et al.* 2010). The recent push toward ecological intensification as a strategy to use biodiversity to boost production and reduce the use of nonrenewable fossil inputs has broadened the debate on agricultural diversity to include integrated landscape management. This new agro-ecosystemic dimension is at the core of the mission of several NGOs, such as Eco-Agriculture Partners.

The third issue-area is trade. Initially, the trade-biodiversity nexus was primarily conceived in terms of the challenges that trade poses to biodiversity. The 1973 Washington Convention on International Trade in Endangered Species, and more recently the 2000 Cartagena Protocol on Biosafety, tackles these concerns. However, in the 1980s, discussions arose on whether the economic valorisation of biodiversity could be translated into incentives for conservation (Swanson 1999). This new commodification paradigm emerged in relation to the great expectations for rapid breakthrough in the life science sector. The 1991 revision of the Convention for the Protection of New Plant Varieties and the 1994 Agreement on Trade-Related Aspects of Intellectual Property Rights (TRIPS) furthered this movement by extending the application of intellectual property rights to living organisms. In the following decades, this incentive-based approach has gained prominence and has been progressively expanded to also include payment for ecosystem services as a tool for preserving ecosystems. It has been promoted by multilateral organizations, including the World Bank and the Millennium Ecosystem Assessment, transnational organizations, such as the Resilience Alliance, and several national agencies.

The fourth issue-area is development. In the 1970s and 1980s, after conservation efforts had been criticized for failing to take human and social dimensions into account, notably in the creation of protected areas in developing countries, several groups and organizations integrated developmental and environmental concerns. Later, in 1992, the Convention on Biological Diversity (CBD) was adopted on the basis of the sustainable development paradigm. It clearly places biological resources under the sovereign rights of states, and it states that national governments have the authority to determine access to resources (art. 15.1). In turn, control over access enables developing countries to claim a share of the benefits arising out of the use of resources from their territory. This "grand bargain" (ten Kate and Laird 2000) aims to balance the needs of both technologically and biologically rich countries. It led to the 2010 adoption of the Nagoya Protocol on Access and Benefit Sharing (Oberthür and Pozarowska 2013). It also relates to propoor strategies of biodiversity, which seek to generate income for resource-dependent communities or provide the means to reduce their vulnerability to shocks. This approach was adopted by the United Nations Conference for Trade and Development BioTrade Initiative, some bilateral donor institutions, such as the UK Department for International Development and NGOs, such as the International Institute for Environment and Development.

Finally, the fifth issue-area is culture. It has long been recognized that cultural and biological diversity are closely related. This has led to several initiatives, such as the UNESCO Man and Biosphere Program established in 1971. Since the 1990s, the impetus of groups, such as the International Society of Ethnobotanists, has encouraged international debates to focus on protecting the traditional ecological knowledge of indigenous communities that depend directly on biodiversity for their survival and livelihood (Posey 1999). The rights of these communities to control access to their traditional knowledge and to benefit from its use by third parties are at the center of the discussions taking place under the 8(j) Working Group of the CBD and the World Intellectual Property Organization's (WIPO) Intergovernmental Committee on Intellectual Property and Genetic Resources, Traditional Knowledge and Folklore.

The different issue-areas, scales, and epistemologies of the biodiversity complex do not always interact in harmony. Several lines of contention appear, with a risk to see certain approaches being set aside. The preservationist approach put forward by some scientists and environmental NGOs is called into question by developmental and commercial considerations. Tensions also remain high when it comes to integrating local communities, including farmers and indigenous groups, in protected areas and the appropriate strategies to provide them with incentives for environmental protection. Approaches based on private property rights, public control, and open access to common goods are difficult to reconcile (Aoki and Luvai 2007). Similarly, equity considerations in relation to the use of biodiversity elements and biosafety concerns over genetically modified organisms have opened up important discussions on their potential conflicts with trade liberalization (Rosendal 2001; Raustiala and Victor 2004).

Tensions also emerge over the appropriate level of intervention for biodiversity conservation and sustainable use. Biodiversity encompasses various levels of observation of living systems, ranging from genes to species and ecosystems. Moreover, addressing the scale interface requires not only a good understanding of the genetic, specific, and ecosystem levels of biodiversity, "but also […] making […] choices concerning which level(s) and across which scale(s) particular aspects of the biodiversity issue are to be addressed" (Koetz *et al.* 2012: 17). In this context, the appropriateness of the multilateral level is often called into question, given that biodiversity loss and ecosystem services are typically place-based and sensitive to local and regional cultures (Swanson 1999; Paavola *et al.* 2009; Duraiappah and Rogers 2011; Holmes 2011; Amano and Sutherland 2013).

Over the years, these tensions have been managed in different ways within the biodiversity complex. In the 1980s, the International Union for Conservation of Nature, a mixed organization whose members included NGOs and governments, made a considerable effort to reconcile different perspectives. In particular, it sought to improve the multidisciplinary dimension of biodiversity research by increasing its social science content for building scientific evidence. This boundary work has tried to correct the fragmented and often species-centric perception of biodiversity governance. For example, it has led to the recognition of man-made diversity as found in specific forest areas or agro-ecosystems, a concept so far ignored by conservationists. In its World Conservation Strategy published in 1980, the IUCN has also been the first organization to promote incentive-based approaches of conservation as complementary to more traditional regulatory measures.

At the end of the 1980s, the IUCN advocated the conclusion of a framework convention on biological diversity. A convention of this type was initially conceived as a way of bringing together other biodiversity-related conventions within a single framework in order to encourage synergies, coherence, and increased efficiency. Although the 1992 CBD did not federate other biodiversity conventions, it did succeed in combining economic, social, and environmental objectives (art. 1) and providing an integrated framework for biodiversity protection at the genetic, specific, and ecosystemic scales (art. 2).

In the post-CBD era, the CBD Subsidiary Body on Scientific, Technical and Technological Advice (SBSTTA) has been formally in charge of knowledge management within the biodiversity complex. SBSTTA was created as "an open-ended intergovernmental scientific advisory body […] to provide the Conference of the Parties […] with timely advice relating to the implementation of the Convention" (art. 25). However, SBSTTA was soon criticized because it functioned more like a mini-CBD club, relying on existing knowledge, than as a true scientific and policy interface capable of producing new scientific-based evidence and assessments on biodiversity erosion to contribute to policy decisions (Koetz *et al.* 2008).

Other attempts to improve knowledge management within the biodiversity complex have proved unsuccessful. The Global Biodiversity Assessment and the Global Biodiversity Outlooks were heavily criticized for their scientific-driven processes, which neglect the political and social aspects of the biodiversity complex (Duraiappah and Rogers 2011). Similarly, the Biodiversity Liaison Group, established in 2004 to enhance cooperation among six biodiversity-related conventions, has had a very limited impact on integrating issue-areas (Scott 2011). A major breakthrough with regard to knowledge management was achieved through the

Millennium Ecosystem Assessment. Thanks to its bottom-up and participative process, this initiative conducted between 2005 and 2011 had greater potential to address tensions arising from different issue-areas, scales, and epistemologies (Reid *et al.* 2006). However, being disconnected from any formal intergovernmental process, it has also had limited impact on policymaking (Görg *et al.* 2010).

Building on the experience of the Millennium Ecosystem Assessment, the Science and Biodiversity Conference held at the UNESCO headquarters in 2005 stressed the importance of establishing "an international or intergovernmental mechanism playing a role akin to that of the IPCC for climate change on all aspects of biodiversity" (Barbault and Leduc 2005). The process of establishing a global science-policy platform for biodiversity was thus launched in 2005, with the goal to emulate the IPCC (Ovodenko and Keohane 2012). This process led to the adoption in June 2010 of the "Busan Outcome," a set of specific recommendations concerning the structure, function, and governance of an intergovernmental platform on biodiversity and ecosystem services (UNEP 2010). The resolution formally establishing IPBES as an independent intergovernmental body was adopted in April 2012 (Granjou *et al.* 2013).

IPBES is supposed to correct the failings of former efforts to manage knowledge associated with the biodiversity complex, including its various thematic, scalar, and epistemological dimensions (Duraiappah and Rogers 2011; Larigaudrie and Mooney 2010; Perrings *et al.* 2011; Koetz *et al.* 2012; Borie and Hulme 2015). IPBES' multithematic ambition clearly appears in its founding resolution, calling for discussion on the "economic, social and cultural value" of biodiversity (UNEP 2012: 4). The resolution establishing IPBES also emphasizes the need to conduct assessments at global, regional, and subregional scales and to take into account inputs from stakeholders at different levels, including scientific organizations, NGOs, local communities, and businesses (UNEP 2012: 1). Above all, IPBES is supposed to link science and policymaking, incorporate all relevant disciplines, and "bring different knowledge systems, including indigenous systems, into the science-policy interface" (UNEP 2012: 4). Thus, it is expected to deliver a kind of 'Rosetta Stone', facilitating communication between different knowledge systems (Diaz *et al.* 2015). Though, it remains to be seen whether the selection of the IPBES Panel and Bureau members lives up to these ambitions and is conducive to generating credible, legitimate, and salient knowledge for the entire biodiversity complex. Although knowledge and institutions tend to coevolve, it is not a fatality that IPBES reproduces dominant perspective (Vadrot 2014).

Methods

In order to assess the IBPES' capacity to contribute to the governance of the biodiversity complex, we examined the complete network constituted by the 41 individuals working at the core of IPBES.[1] Sixteen of them are members of the Bureau, *i.e.*, IPBES' political body, with the chair representing the Platform. The remaining 25 are members of the “Multidisciplinary Expert Panel” (MEP) and have the mandate to carry out the scientific and technical functions agreed upon by the Plenary.[2]

These 41 individuals were appointed following a lengthy selection process. In 2012, IPBES launched an expert survey to which 6841 scientists from 136 different countries responded in order to express their views on the selection procedure for the Panel (IPBES Bureau, n.d.a). In particular, in 2013, just before IPBES' first preliminary meeting, it was decided that governments, grouped according to region, would be invited to suggest potential experts. Yet, once the initial list of nominees had been drafted, IPBES realized that the nomination process “was largely based on sub-regional interests and allocations” and that “there was a considerable disciplinary and gender imbalance in the original nominations received” (IPBES Bureau, n.d.a.). As a result, the interim Bureau conducted a second round of regional consultations in order to redress the balance between disciplines (natural and social sciences), gender (men and women), and geographical regions (the five UN regional groups: Africa, Asia, Latin America, Western countries, and Eastern Europe).

These three formal criteria are not at odds with similar bodies established by the UN at the global level. However, the specific multi-faceted nature of biodiversity and previous controversies about the process of knowledge production that surrounded IPCC in 2010 (known as ‘Climategate’) could reasonably have suggested that additional selection criteria be put forward. While the criteria put forward by IPBES are important, they are certainly incomplete if IPBES is to generate knowledge that is seen as credible, legitimate, and salient by actors from the different issue-areas, scales, and epistemologies of the biodiversity regime complex.

To assess the representativeness of these latter dimensions, we coded the attributes of MEP and Bureau members. The coding was conducted on the basis of the members' curriculum vitae, which are publicly available on the IPBES website. Coders used a common codebook, and each variable was independently coded by at least two different coders. In cases where divergences arose between coders, the final score was determined following discussion.

The first dimension of the regime complex — the horizontal one — is thematic and concerns issue-areas. As discussed in the previous section, we conceptualize the biodiversity regime complex as being made of five issue-areas, namely the environment, trade, development, agriculture, and culture. The representativeness of these issue-areas is assessed with the help of two variables. The first variable is the expertise of each of the 41 individuals in the five issue-areas, which depends on their professional experience and publication records. Expertise is understood here as a variable with nonexclusive values. Some MEP members, for example, have limited expertise on environmental issues, while others have broad expertise on environmental, cultural, and agricultural aspects of biodiversity. The second variable related to issue-areas is the experience of each individual within international organizations (IOs), as provided by the individuals' records of employment, consultancy, and participation in occasional meetings organized by different IOs. According to their

CVs, the 41 MEP and Bureau members have a combined experience of 31 different IOs, most of which could be associated with one of the five issue-areas of the biodiversity regime complex. For example, experience with the WTO or the WIPO is associated with the issue-area of trade, and experience with UNDP or the World Bank is associated with that of development.

We analyze two different scales for the vertical dimension of the biodiversity regime complex: biological and political. For the biological scale, we follow the CBD's three-layered definition of biological diversity: "Diversity within species, between species and of ecosystems" (art. 2). The expertise of MEP and Bureau members is, therefore, coded with the nonexclusive values of genetic, specific, and ecosystemic levels. The political scale is assessed according to four levels of governance: local, national, transnational, and international. The local level refers to political entities that are subnational, such as communities, groups of women, or small farmers. The national level refers to governmental politics of a single sovereign state, and the international level to the interaction of at least two governments. The transnational level refers to expertise concerning nonstate initiatives that cross national boundaries, often in conjunction with NGOs or industries.

The representativeness of the epistemological dimension of the biodiversity regime complex is assessed according to two variables: knowledge system and profession. The variable knowledge system has three nonexclusive values: natural science, social science, and traditional knowledge. The first two values depend on the discipline of training, and the third is determined by professional activities and publications. It is important to note that none of the MEP and Bureau members claim to be direct holders of traditional ecological knowledge, but some do study and interact directly with traditional knowledge holders. The variable of profession is indicated by two nonexclusive values: scientists and policymakers. We consider a scientist to be any individual who has published at least one peer-reviewed publication, and a policymaker to be any individual who has worked full time for a governmental or intergovernmental organization for at least 1 year.

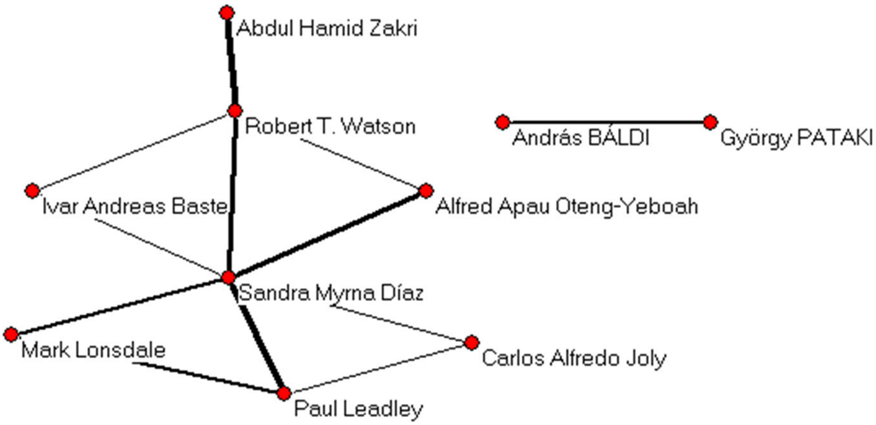
In addition to presenting the numerical results associated with our coding, our main methodological claim is that SNA has a valuable contribution to make to the study of representativeness within boundary organizations. Rather than placing all individuals on an equal footing, SNA makes it possible to measure and visualize social relations within a group and to include this information into the analysis of representation. Two specific measures of "social representativeness" are particularly relevant to assess the capacity of IPBES to generate credible, legitimate, and salience knowledge, and in doing so to contribute to the governance of the biodiversity regime complex.

First, SNA can be used to measure degrees of centrality. In the social dynamic internal to IPBES, the attributes of central players, with connections to several other individuals, will likely have greater weight than the attributes of isolated and peripheral individuals. Central players are well positioned to access information, communicate their view, and build discursive coalitions. Therefore, if individuals with expertise on certain issue-areas, scales, and epistemologies display a disproportionally high degree of centrality, knowledge generated by IPBES risks being biased in favor of these areas of expertise, and risk being delegitimized by actors concerned with marginalized areas of expertise. For IPBES to have a greater likelihood to generate knowledge seen as credible, legitimate, and salient in the entire biodiversity regime complex, individuals with expertise on different issue-areas, scales, and epistemologies should display a similar degree of centrality.

Second, SNA can be used to analyze degrees of heterophily,[3] Individuals with heterophile social relations, *i.e.,* with ties to individuals with expertise on issue-areas, scales, and epistemologies other than their own, are more likely to have a comprehensive view of the regime complex, to become knowledge brokers, and to generate integrative knowledge. Thus, it seems important, for the balance of the entire regime complex that the various issue-areas, scales, and epistemologies display within IPBES a similar degree of heterophily. There are no specific benchmarks to assess the appropriate level of centrality or heterophily, as these measures are analyzed in relative terms when comparing different issues-areas, scales, and epistemologies.

Using SNA to measure degrees of centrality and heterophily requires documenting social relations among MEP and Bureau members. We use three indicators that were readily available to map these relations: copublication, comembership, and coparticipation. Copublication is a proxy to evidence the network of collaboration between experts (Newman 2004). It refers to the number of books, edited volumes, articles, or reports that 2 individuals have in common as coauthors or coeditors. Comembership refers to current or past membership of 2 individuals to the same scientific or professional organization.[4] Coparticipation refers to the participation of 2 individuals at the same international conferences. Comembership and coparticipation networks are used as proxies to capture the proximity of experts. This helps understand if experts are embedded in similar or different institutional environments (Hafner-Burton *et al.* 2009). Information for these three indicators was collected from CVs, as well as by using systematic Google searches of pairs of individuals. Results were then presented to some MEP and Bureau members to assess the validity of our coding.

Building on these indicators, we can generate different maps of the IPBES network. The copublication map is the least developed (see Graph 1). Only 10 out of 41 individuals are connected on the map, with an overall density of only 3 %.[5] Moreover, these connections form two different subnetworks without any link bridging them: one is composed of 2 individuals who share one publication in common; and the other is made up of 8 individuals with multiple copublication ties. Five key individuals in the latter subnetwork have at least three publications in common. Among these publications, many are ecosystem assessments, conducted either under the Millennium Ecosystem Assessment or the Global Biodiversity Assessment. If we look more closely, 2 individuals appear to play a key role in this



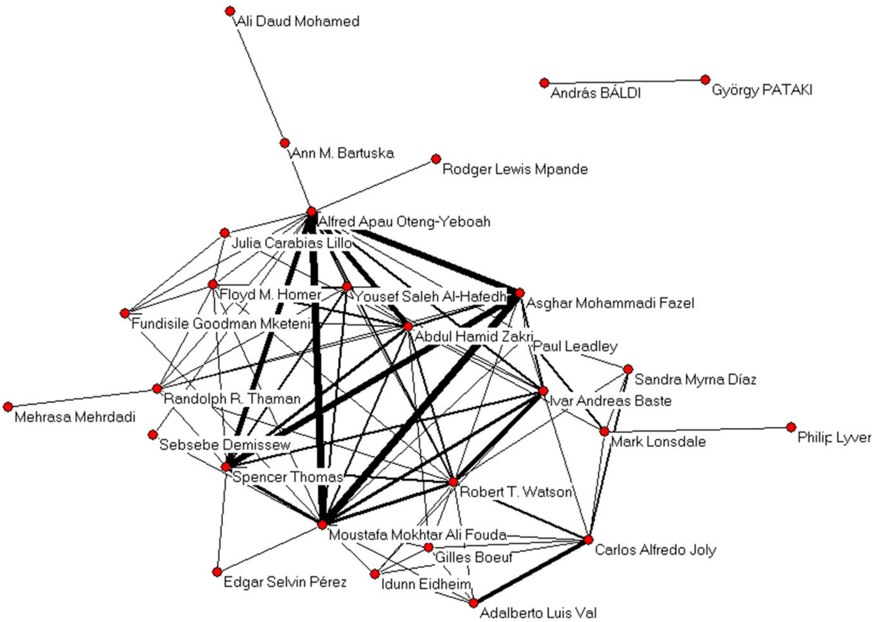
Graph 1 The IPBES social network of copublications. The lines on the three graphs represent the links. The darker and thicker they are, the more important the links between the players.

subnetwork: Sandra Diaz, who creates a bridge between two different parts of the subnetwork; and Robert Watson, who forms the link between the current IPBES chair, Abdul Amid Zakri, and the rest of the copublication network.

Coparticipation is the second indicator on which the SNA is based. The graph obtained (see Graph 2) shows a greater level of density (21 %) than the copublication map. In total, 28 individuals are engaged in coparticipation, among which five appear prominently at the center of the network. Most of these central individuals have been jointly involved in international environmental negotiations, in particular under the CBD and DIVERSITAS conferences.

Finally, the comembership network generates a denser map (see Graph 3). Given that membership was defined in broad and inclusive terms, the vast majority of MEP and Bureau members appear to have been embedded in common institutional frameworks. Only 3 individuals are disconnected from this network, which has an overall density of 89 %.

To create one final social network linking the MEP and Bureau members, the three indicators were integrated in a common network (see Graph 4). Since the three indicators do not carry the same significance and have different degrees of specificity, they were weighted before being integrated in a multiplexity index. Copublication, the most engaging social relation, is weighted 3; coparticipation is weighted 2; and comembership, the least engaging social relation, is weighted 1. The weighting is, therefore, inversely proportional to the density of the indicator. While copublication relations were less numerous, the combined graph shows clearly that, once weighted according to the social importance of the relation the copublication network remains an important subnetwork within the combined network.

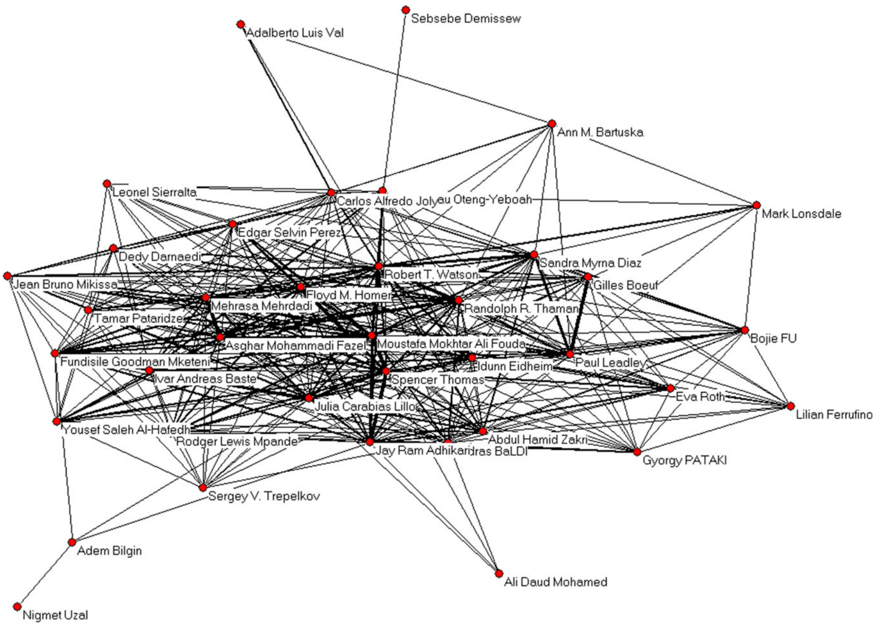


Graph 2 The IPBES social network of coparticipation.

Results

Conducting a SNA of MEP and Bureau members provides a richer and more detailed picture of IPBES representativeness than simple numeric counting. If one looks at the IBPES criteria for selecting MEP and Bureau members, there is a marked difference between their numeric and social representativeness (see Table 1). Numerically, each UN region appears well represented. This is hardly surprising since the nomination and selection process was governed by regional groups. Africa, Asia–Pacific, Latin America, Western Europe, and Eastern Europe have more or less the same number of representatives. This apparent equilibrium, however, hides important imbalances in social representativeness. Individuals from Latin America and Asia–Pacific are on average well connected, while those from Eastern Europe are particularly marginalized. Eastern Europeans have few connections with individuals from other regions and with one another, which may undermine their social capacity to contribute to IPBES discussions.

Achieving gender balance was a second objective pursued by IPBES during the selection process. As noted by IPBES designers, women are numerically underrepresented among MEP and Bureau members. Interestingly though, selected women have on average the same number of connections to other individuals as men. Moreover, women and men are socially connected to each other, as the degree of homophily within each

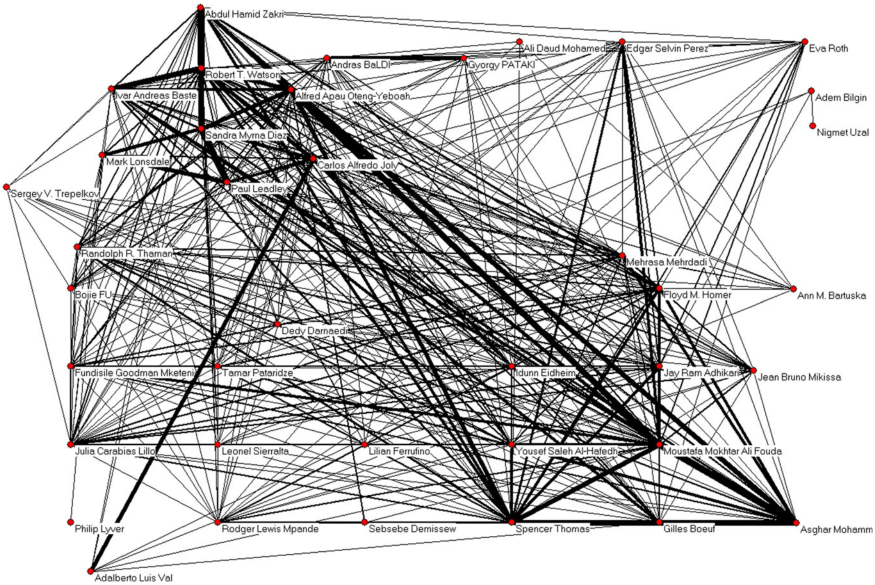


Graph 3 The IPBES social network of comembership.

gender group is significantly lower than its heterophily. Nonetheless, only two women appear in the top ten of the most connected individuals (see "Annex").

Beyond the formal criteria of regional and gender balances as set up by IPBES for the selection process, we further develop the analysis by paying attention to the representativeness of issue-areas, scales, and epistemologies of the biodiversity regime complex. Regarding issue-areas, it is not surprising that the environmental expertise appears to be well represented within the IPBES network (see Table 2). Thirty-seven MEP or bureau members (90 % of the total) have substantial expertise on environmental issues and 24 (71 % of the total) have experience with environmental IOs. These "environmental" experts have by far the greatest sum of connections and have a fair centrality average. In the top ten of the most connected individuals, nine have considerable environmental expertise, and all have experience with environmental-related IOs (see "Annex").

The second issue-area that is most represented numerically and socially is development. Among the top ten of the most connected individuals, seven have expertise in development, six have experience with development-related IOs, and only one has neither (see "Annex"). In fact, several MEP and bureau members have expertise both in the environment and development. The few development experts who are less familiar with environmental issues tend to be highly connected to environmental experts.



Graph 4 The IPBES combined social network (copublications, coparticipation, and comembership).

There are fewer experts on agriculture, but they are on average well connected. Whether one looks at thematic expertise or experience of IOs, agricultural experts have a greater centrality ratio (40 and 23 %, respectively) than their numeric representativeness ratio (37 and 17 %, respectively). Moreover, agricultural experts display a good balance between homophily and heterophily, in the sense that they have several connections with individuals sharing their expertise and experience, as well as connections with other groups.

Culture and trade are the least represented issue-areas, both numerically and socially. Yet, experts with experience at UNESCO have a relatively high degree of average centrality. In contrast, only one person has experience with trade negotiations and a weak connection to other members of the MEP and Bureau.

Some important imbalances also appear on the scalar dimension (see Table 3). Regarding the biodiversity scale, results show an important imbalance in favor of the ecosystem level, with 85 % of MEP and Bureau members, involving 86 % of social connections. In contrast, only 20 % of individuals have expertise at the genetic level. The few genetic experts have on average a low centrality score (30) and represent only 16 % of social connections. Moreover, they have a low level of homophily (17 %), indicating that few connections exist within the group, which means that the group could have difficulties speaking with one voice.

On the governance scale, the national level in particular is greatly overrepresented. All but four of the MEP and Bureau members have some expertise in

Table 1 Numeric and social representation for gender and regions

	Numeric representation		*Social representation*					
			Measures of centrality			*Measures of homophily*		
	Number by category	*% of the population*	*Sum of centralities (absolute)*	*Sum of centralities (%)*	*Average centrality*	*Homophily (%)*	*Heterophily (%)*	*Outside category density (%)*
Gender								
Women	9	22	344	23	38	12	38	24
Men	32	78	1180	77	37	24	38	12
UN Regions								
Africa	8	20	259	17	32	28	43	22
Asia–Pacific	8	20	379	25	47	38	50	19
Eastern Europe	7	17	152	10	22	11	13	29
Latin America	9	22	389	26	43	30	50	19
West. Europe	9	22	345	23	38	33	42	21
Population	41		1524		37			

Table 2 Numerical and social representation for the issue-area dimension

	Numeric representation		*Social representation*					
			Measures of centrality			*Measures of homophily*		
	Number by category	*% of the population*	*Sum of centralities (absolute)*	*Sum of centralities (%)*	*Average centrality*	*Homophily (%)*	*Heterophily (%)*	*Outside category density (%)*
Issue-area expertise								
Environment	37	90	1324	87	36	19	62	75
Trade	10	24	313	21	31	21	42	22
Development	18	44	795	52	44	34	40	17
Agriculture	15	37	606	40	40	42	45	14
Culture	10	24	348	23	35	14	41	23
Experience with IOs								
IOs Enviro.	24	59	1089	71	45	44	23	7
IO Trade	1	2	26	2	26	0	11	23
IOs Develop.	12	29	611	40	51	61	48	13
IOs Agr.	7	17	346	23	49	58	51	19
IOs Culture	9	22	456	30	51	56	59	15
Population	41		1524		37			

Table 3 Numerical and social representation for the scale dimension

	Numeric representation		*Social representation*					
			Measures of centrality			*Measures of homophily*		
	Number by category	*% of the population*	*Sum of centralities (absolute)*	*Sum of centralities (%)*	*Average centrality*	*Homophily (%)*	*Heterophily (%)*	*Outside category density (%)*
Biodiversity scale								
Genetic	8	20	237	16	30	17	38	23
Species	21	51	769	50	36,5	24	41	22
Ecosystems	35	85	1314	86	37,5	25	30	9
Governance scale								
Local	14	34	421	28	30	13	29	32
National	37	90	1413	93	38	23	32	8
Transnational	12	29	475	31	40	16	38	25
International	22	54	1032	68	47	45	29	7
Population	41		1524		37			

national governance, whether through national bureaucracies, national projects, or national programs. Of the 31 individuals with expertise at more than one level of governance, only one lacks expertise in national governance.

Individuals with experience in international governance are also very well represented numerically (54 %), and socially (68 %). They have on average significantly more connections within the IPBES network than their peers. In the top ten of the most connected individuals, eight have expertise at the international level of governance (see "Annex"). These international experts also display a particularly high level of homophily (45 %), indicating that many attend the same conferences, share memberships, and publish together. This result was predictable given that the international stage allows experts to make connections and IPBES is also an international organization. The nomination and selection of international experts reflect the latter's connections and interest in international policymaking.

Experts with local or transnational experience are much less-well represented. In particular, those with local expertise have a lower centrality ratio (28 %) than in numerical ratio (34 %). They have a low average centrality (30), as well as few connections with each other (13 %) and with other experts (29 %). This seriously undermines the potential to represent local perspectives with a strong voice within IPBES.

The analysis of the epistemological dimension also reveals imbalances (Table 4). As in the case of knowledge systems, natural scientists are overrepresented numerically (88 %) and socially (87 %). Nine of the ten most connected individuals have training in natural science (see "Annex"). While social scientists appear to have more connections (43) than natural scientists (37), this result is actually distorted by the law of averages, *i.e.*, the highly disproportionate number of natural scientists compared to scientists from other disciplines lowers their average score for centrality. In addition, more than half of the social scientists are Bureau members and their average coparticipation is higher than for MEP members. Once this is taken into account, it is fair to argue that natural scientists are significantly better represented than social scientists.

Yet, the most marginalized knowledge system is not social science but traditional knowledge. Among the MEP and Bureau members there are no direct holders of traditional knowledge, and those indirectly familiar with traditional knowledge have a lower average of centrality (35 %), a lower level of homophily (13 %), and a lower degree of heterophily (37 %).

For the profession variable, it appears that there is a fairly good numerical balance between scientists and policymakers. While there are more scientists (63 vs. 51 %), they are slightly less connected (57 vs. 61 %). Rather surprisingly, not all members of the Bureau have worked for a governmental organization, and not all members of the Panel have published in peer-reviewed journals. Rather, scientists and policymakers are distributed in two IPBES groups. More importantly, six people — including two of the most connected individuals — have experience both in scientific production and policymaking.

Table 4 Numerical and social representation for the epistemological dimension

	Numeric representation		*Social representation*					
			Measures of centrality			*Measures of homophily*		
	Number by category	*% of the population*	*Sum of centralities (absolute)*	*Sum of centralities (%)*	*Average centrality*	*Homophily (%)*	*Heterophily (%)*	*Outside category density (%)*
Knowledge system								
Natural sciences	36	88	1330	87	37	43	56	17
Social sciences	11	27	468	31	43	27	42	22
Traditional knowledge	10	24	346	23	35	13	37	25
Profession								
Scientists	26	63	863	57	33	21	38	34
Policymakers	21	51	928	61	44	38	32	17
Population	41		1524		37			

Individuals with this type of hybrid profile are presumably familiar with navigating between the two spheres. As on average they are well connected in IPBES network, they are well positioned to bridge the two knowledge spheres. They are arguably one of the IPBES' best assets in terms of meeting its objectives as a boundary organization.

Discussion and conclusion

The results of our assessment are mixed. The analysis of social representation shows that the current membership of IPBES provides a fairly good balance of experts with scientific and policy backgrounds. Several scientists associated with IPBES are particularly well positioned to understand the nature of the policy processes and interact with policymakers. This social capital could enable IPBES to effectively bridge the science and policy interface in order to generate credible, legitimate, and salient knowledge (Koetz *et al.* 2012; Brigg and Knight 2011). This finding suggests that the lessons from previous biodiversity assessments, in particular the Millennium Ecosystem Assessment, have been taken into account.

Another promising finding is the integration of environmental and developmental concerns. Reflecting the currently prevalent sustainable development paradigm, these two issue-areas are well represented and positioned within the IPBES network. Although the prominence of development expertise might be an unintended consequence of the geographical distribution of IPBES seats, it is arguably a prerequisite if IPBES is to have a significant impact in developing countries, where biodiversity is often the richest and the most vulnerable.

The appraisal is less clear-cut when it comes to knowledge systems. Though numerically low, social scientists are socially well connected in the IPBES network and could provide important inputs to increase the relevance of IPBES' work (Duraiappah and Rogers 2011). However, the expertise of social scientists is highly concentrated in the fields of economy and management. This supports other studies, which argue that the biodiversity regime complex is biased in favor of a market-based approach, in the form of bioprospection or payments for environmental services (Holmes 2011; Brand and Vadrot 2013; Daccache 2013, Vadrot 2014). Yet, we have found very few Panel and Bureau members having practical experience in the trade regime or transnational businesses. This lack of first-hand experience and practical knowledge could lead to unrealistic or clichéd views of the market and could weaken IPBES' ability to deal with real-world industrial stakeholders.

Ethnography, sociology, philosophy of sciences, and other disciples that are crucial for a reflexive and selfcritical boundary organization are not represented within IPBES. This is unfortunate, as environmental sciences are not independent from social, cultural, and political processes. The notion of "invasive species," for example, is socially constructed and highly dependent on the social context (Humair *et al.* 2014). Without the reflexive inputs of social sciences, IPBES risks building its knowledge on implicit and shaky assumptions. In this respect, IPBES seems to be just another illustration of the dominant yet insulated position of economists within social sciences (Fourcade *et al.* 2015). As other boundary organizations, IPBES has a lot to learn from the IPCC's failure to take social sciences — apart from economics — more seriously (Corbera *et al.* 2015; Beck *et al.* 2014).

The weak social representation of cultural issues, local level interests, genetic scale, and traditional epistemologies in the IPBES network is potentially of greater concern. Taken together, the underrepresentation of these intertwined dimensions could have important policy implications and affect the IPBES' success in the long term. Since cultural, local, and indigenous stakeholders have traditionally been marginalized in the overall biodiversity complex, there has been a strong political outcry, and scientific arguments have been put forward for their adequate inclusion in IPBES (Hulme *et al.* 2011; Sutherland *et al.* 2013). Yet, despite the insistence of the Busan Outcome, the selection process has failed to take these concerns into proper consideration. IPBES faces the risk of remaining locked into a science-policy mindset that is limited to a bilateral dialogue between (global) scientists and (national) decision-makers on species and ecosystem conservation through the usual understanding of the causes of biodiversity loss and changes in ecosystem services. Too often, this approach is based on classical models where scientifically based solutions to biological degradation are seen as universally applicable (Holmes 2011; Koetz *et al.* 2012; Kovács and Pataki 2016) and to be implemented by state-centric institutions (Kutting and Lipschutz 2009).

These fundamental shortcomings of IPBES to reflect the whole range of dimensions of the biodiversity complex raise concerns for its ability to fully achieve its role as a boundary organization. It could even be argued, as Vadrot puts it, that eventually "the IPBES project sustains and reproduces dominant perspectives" (2014: 5; see also Turnhout *et al.* 2016). However, our analysis points to promising findings that nuance such a gloomy picture. Although the analysis suggests that some imbalances persist, it also shows that there are key individuals who, if properly supported, can mobilize their network assets to act as real knowledge brokers, engaged in "epistemic arbitrage" (Seabrooke 2014), and counterbalance existing shortcomings. Alfred Apau Oteng-Yeboah, for example, plays an important role by bridging the copublication subnetwork (mainly scientists) to the coparticipation subnetwork (mainly policymakers). Including more knowledge brokers like him among IBPES Panel and Bureau members could facilitate the flow of information and create a social environment conducive to generating knowledge seen as legitimate, credible, and salient across the biodiversity regime complex.

To be sure, the representativeness of current Panel and Bureau members is not the only factor that will determine the IPBES' fate as a boundary organization. In the short term, stakeholders' consultations, expert groups, and task forces established by IPBES could palliate internal deficiencies by reaching out to external expertise. In the medium term, the selection of future experts represents an opportunity to correct some numeric and social imbalances and this article offers some insights for this endeavor. Basing selection criteria on clear thematic, scalar, and epistemological aspects might be more appropriate than the regional approach currently used. The latter practice was borrowed from the United Nations General Assembly, inherited from the Cold War, and is somewhat disconnected from any natural or cultural aspects of biodiversity.

Beyond the IPBES case, using SNA to assess the representativeness of an international organization appears to be a promising approach. The method introduced in this article, based on the concept of "social representativeness" and operationalized by measures of centrality and heterophily, challenges the traditional vision of representativeness as a numerical reflection of regions, gender, or other categories. Our results clearly show that focusing exclusively on numerical representativeness could overlook persistent representativeness bias. Individuals appointed to an organization have a history of social relations, punctuated by their professional trajectories, and often crossing the public/private or the domestic/international dichotomies. If one takes these social relations into account, a category of individuals fairly represented from a numerical perspective can remain socially underrepresented. Therefore, our SNA-based method can usefully be replicated to analyze other international organizations. It can also be used in comparative analysis to contrast the capacities of different organizations to generate legitimate, credible, and salient knowledge. As knowledge management is increasingly recognized as central to global governance, and as a growing number of international organizations populate world politics, scholars and policymakers alike need innovative tools to assess the representativeness of international organizations.

The proliferation of international institutions is often deemed to benefit the already powerful actors. This argument is typically supported by claims that new institutions create forum-shopping opportunities for powerful states (Drezner 2009). This article points to another explanation of this phenomenon by unpacking international organizations and showing how they are penetrated by transnational professional networks (Stone 2013). New organizations do not only create forum-shopping opportunities, they also reproduce the structural imbalances of their environment in their own internal composition. This article supports this claim by studying the hard case of IPBES, a boundary organization that explicitly aims at reflecting the entire biodiversity regime complex and fostering synergies among existing institutions. The "social representativeness" of other international organizations that are not as sensitive as IPBES to the importance of diversity is presumably more imbalanced.

Acknowledgments

This research benefited from the support of the Agence nationale pour la recherche française in the framework of the Project <ANR-12-GLOB-0001-03 CIRCULEX>. The authors would like to thank Nina Hall, Radoslav Dimitrov, Tobias Böhmelt, and other participants of the WIRE workshop, the

AGORA V Workshop, the ECSN session, and the ISA panel where earlier versions of this article have been presented for their comments and suggestions.

Notes

1 As of January 1st 2014.
2 Members of the Bureau and of the Panel are analyzed together as, in practice, their selection results for a similar process and their responsibilities overlap.
3 A network with a high degree of heterophily is one whose members have more ties with actors from different and heterogeneous groups than with actors within their group.
4 Membership is defined here in a broad sense and includes proper membership, as well as work with the financial assistance of an organization.
5 In SNA the density of a network refers to its cohesion. The density is captured by measuring the sum of links inside a network divided by the number of possible links.

References

Abbott, Kenneth W. (2012) 'The Transnational Regime Complex for Climate Change', *Environment & Planning C: Government & Policy* 30(4): 571–90.
Abbott, Kenneth W. and Duncan Snidal (2010) 'International Regulation without International Government: Improving IO Performance through Orchestration', *Review of International Organizations* 5(3): 315–44.
Abbott, Kenneth W., Jessica F. Green and Robert O. Keohane (2015) 'Organizational Ecology and Institutional Change in Global Governance', *International Organization*, forthcoming.
Alter, Karen J. and Sophie Meunier (2009) 'The Politics of International Regime Complexity', *Perspectives on Politics* 7(1): 13–24.
Amano, Tatsuya and William J. Sutherland (2013) 'Four Barriers to the Global Understanding of Biodiversity Conservation: Wealth, Language, Geographical Location and Security', *Proceedings of the Royal Society B: Biological Sciences* 280(1756): 1–7.
Andersen, Regine (2008) *Governing Agrobiodiversity: Plant Genetics and Developing Countries*, Farnham: Ashgate.
Aoki, Keith and Kennedy Luvai (2007) 'Reclaiming Common Heritage Treatment in the International Plant Genetic Resources Regime Complex', *Michigan State Law Review* 35: 35–70.
Barbault, Robert and Jean-Patrick Leduc (2005) *Proceedings of the International Conference on Biodiversity, Science and Governance for Sustainable Development*, 23–28 January. Paris: UNESCO.
Beck, Silke (2011) 'Moving Beyond the Linear Model of Expertise? IPCC and the Test of Adaptation', *Regional Environmental Change* 11(2): 297–306.
Beck, Silke, Maud Borie, Jason Chilvers, Alejandro Esguerra, Katja Heubach, Mike Hulme, Rolf Lidskog, Eva Lövbrand, Elisabeth Marquard, Clark Miller, Tahani Nadim, Carsten Neßhöver, Josef Settele, Esther Turnhout, Eleftheria Vasileiadou and Christoph Görg (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.
Benvenisti, Eval and George Downs (2007) 'The Empire's New Clothes: Political Economy and the Fragmentation of International Law', *Stanford Law Review* 60(2): 595–631.
Berkes, Fikret (2009) 'Evolution of Co-management: Role of Knowledge Generation, Bridging Organizations and Social Learning', *Journal of Environmental Management* 90(5): 1692–702.
Biermann, Frank, Philipp Pattberg, Harro Van Asselt (2009) 'The Fragmentation of Global Governance Architectures: A Framework for Analysis', *Global Environmental Politics* 9(4): 14–40.

Bjurström, Andreas and Merritt Polk (2011) 'Physical and Economic Bias in Climate Change Research: A Scientometric Study of IPCC Third Assessment Report', *Climatic Change* 108(1–2): 1–22.
Borie, Maud and Mike Hulme (2015) 'Framing Global Biodiversity: IPBES between Mother Earth and Ecosystem Services', *Environmental Science & Policy* 54: 487–496.
Böhmelt, Tobias and Gabriele Spilker (2015) 'The Interaction of International Institutions from a Social Network Perspective', *International Environmental Agreements*, forthcoming.
Brand, Ulrich and Alice Vadrot (2013) 'Epistemic Selectivities and the Valorisation of Nature: the Cases of the Nagoya Protocol and the Intergovernmental Science-Policy Platform for Biodiversity and Ecosystem Services (IPBES)', *Law, Environment and Development Journal* 9(2): 202–20.
Brand, Ulrich and Christoph Görg (2013) 'Regimes in Global Environmental Governance and the Internationalization of the State: The Case of Biodiversity Politics', *International Journal of Social Science Studies* 1(1): 110–22.
Briggs, Sue V. and Andrew T. Knight (2011) 'Science-Policy Interface: Scientific Input Limited', *Science* 333(6043): 696–97.
Cash, David W., Niel W. Adger, Fikret Berkes, Po Garden, Louis Lebel, Per Olsson, Lowell Pritchard, and Oran Young (2006) 'Scale and Cross-Scale Dynamics: Governance and Information in a Multilevel World', *Ecology & Society* 11(2): 8–19.
Cash, David W., William C. Clark, Frank Alcock, Nancy M. Dickson, Noelle Eckley, David H. Guston, Jill Jäger, Ronald B. Mitchel (2003) 'Knowledge Systems for Sustainable Development', *Proceedings of the National Academy of Sciences* 100(14): 8086–91.
Clark, William. Tomich Thomas, Meine Van Noordwijk, Nancy Dickson, Delia Catacutan, David Guston and Elizabeth McNie (2010) *Toward a General Theory of Boundary Work: Insights from the CGIAR's Natural Resource Management Programs*. Harvard Kennedy School.
Coleman, James (1988) 'Social Capital in the Creation of Human Capital', *American Journal of Sociology* 94: 95–120.
Corbera, Esteve, Laura Calvet-Mir, Hannah Hughes and Matthew Paterson (2015) 'Patterns of authorship in the IPCC Working Group III Report', *Nature Climate Change*, doi:10.1038/nclimate2782.
Crona, Beatrice I. and John N. Parker (2011) 'Network Determinants of Knowledge Utilization Preliminary Lessons from a Boundary Organization', *Science Communication* 33(4): 448–71.
Daccache, Michel (2013) 'Questioning Biodiversity Governance through Its Articulations', *Science Technology & Society,* 18(1): 51–62.
Davis, Christina L. (2009) 'Overlapping Institutions in Trade Policy', *Perspectives on Politics* 7(1): 25–31.
Diaz, Sandra, Sebsebe Demissew, Carlos Joly, Mark Lonsdale and Anne Larigaudrie (2015) 'A Rosetta Stone for Nature's Benefit to People', *PLoS Biology* 13(1): e1002040.
Drezner, Daniel W (2009) 'The Power and Peril of International Regime Complexity', *Perspectives on Politics* 7(1): 65–70.
Duit, Andreas and Victor Galaz (2008) 'Governance and Complexity—Emerging Issues for Governance Theory', *Governance* 21(3): 311–35.
Duraiappah, Anantha Kumar and Deborah Rogers (2011) 'The Intergovernmental Platform on Biodiversity and Ecosystem Services: Opportunities for the Social Sciences', *European Journal of Social Science* 24(3): 217–25.
Fourcade, Marion, Etienne Ollion and Yann Algan (2015) 'The Superiority of Economists', *Journal of Economic Perspectives* 29(1): 89–113.
Gehring, Thomas and Benjamin Faude (2014) 'A Theory of Emerging Order within Institutional Complexes', *Review of International Organizations* 9(4): 471–98.
Gehring, Thomas and Sebastian Oberthür (2009) 'The Causal Mechanisms of Interaction between International Institutions', *European Journal of International Relations* 15(1): 125–56.
Gepts, Paul 2006. 'Plant Genetic Resources Conservation and Utilization', *Crop Science* 46(5): 2278.
Gieryn, Thomas F. (1983) 'Boundary-Work and the Demarcation of Science from Non-Science: Strains and Interests in Professional Ideologies of Scientists', *American Sociological Review* 48(6), 781–95.

Görg, Christoph, Carsten Neßhöver, and Axel Paulsch (2010) ‘A New Link between Biodiversity Science and Policy’, *Perspectives for Science* 19(3): 183–86.

Granjou, Céline. Isabelle Mauz Séverine Louvel and Virginie Tournay (2013) ‘Assessing Nature? The Genesis of the Intergovernmental Platform on Biodiversity and Ecosystem Services (IPBES)’, *Science Technology & Society* 18(1): 9–27.

Green, Jessica F (2013) ‘Order Out of Chaos: Public and Private Rules for Managing Carbon’, *Global Environmental Politics* 13(2): 1–25.

Gupta, Aarti, Till Pistorius and Marjanneke J. Vijge (2015) ‘Managing Fragmentation in Global Environmental Governance: the REDD + Partnership as Bridge Organization’, *International Environmental Agreement*, forthcoming.

Guston, David H (2001) ‘Boundary Organizations in Environmental Policy and Science: An Introduction’, *Science, Technology, and Human Values* 21: 399–408.

Haas, Ernst B (1980) ‘Why Collaborate’, *World Politics* 32(3): 357–405.

Hafner-Burton, Emilie Miles, Kahler M, and Alexander H. Montgomery (2009) ‘Network Analysis for International Relations’, *International Organization 63*(03): 559–92.

Holmes, George (2011) ‘Conservation’s Friends in High Places: Neoliberalism, Networks, and the Transnational Conservation Elite’, *Global Environmental Politics* 11(4): 1–21.

Hulme, Mike, Martin Mahony, Silke Beck, Christoph Görg, Bernd Hansjürgens, Jennifer Hauck, Carsten Nesshöver, Axel Paulsch, Marie Vandewalle, Heidi Wittmer, Stefan Böschen, Peter Bridgewater, Mariteuw Chimère Diaw, Pierre Fabre, Aurelia Figueroa, Kong Luen Heong, Horst Korn, Rik Leemans, Eva Lövbrand, Mohd Norowi Hamid, Chad Monfreda, Roger Pielke Jr., Josef Settele, Marten Winter, Alice B. M. Vadrot, Sybille van den Hove, and Jeroen P. van der Sluijs (2011) ‘Science-Policy Interface: Beyond Assessments’, *Science 333*(6043): 697–98.

Humair, Franziska, Peter Edwards, Michael Siegrist, and Christoph Kueffer (2014) ‘Understanding Misunderstandings in Invasion Science: Why Experts Don’t Agree on Common Concepts and Risk Assessments’, *NeoBiota* 20: 1–30.

IPBES interim bureau. n.d. a. *Findings of the Global IPBES Assessment Survey*.

IPBES interim bureau. n.d. b. *IPBES Selection Process for the MEP – Review Draft.*

Jasanoff, Sheila (1996) ‘Is Science Socially Constructed—And Can it still Inform Public Policy?’, *Science and Engineering Ethics* 2(3): 263–76.

Johnson, Tana and Johannes Urpelainen (2012) ‘A Strategic Theory of Regime Integration and Separation’, *International Organization* 66(4): 645–77.

Kelley, Judith (2009) ‘The More the Merrier? The Effects of Having Multiple International Election Monitoring Organizations’, *Perspectives on Politics* 7(1): 59–64.

Kellow, Aynsley (2012) ‘Multi-Level and Multi-Arena Governance: the Limits of Integration and the Possibilities of Forum Shopping’, *International Environmental Agreements* 12(4): 327–42.

Keohane, Robert O. and Victor, David G. (2011) ‘The Regime Complex for Climate Change’, *Perspectives on Politics* 9(1): 7–23.

Kim, Rakhyun E. and Brendan Mackey (2014) ‘International Environmental Law as a Complex Adaptive System’, *International Environmental Agreements* 14: 5–24.

Koetz, Thomas, Peter Bridgewater, Sybille Van Den Hove and Bernd Seibenhümer (2008) ‘The role of the Subsidiary Body on Scientific, Technical and Technological Advice to the Convention on Biological Diversity as science–policy interface’, *Environmental Science & Policy* 11(6): 505–516.

Koetz, Thomas, Katharine N. Farrell, and Peter Bridgewater (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.

Kovács, Eszter Krasznai and Gyögy Pataki (2016) ‘The Participation of Experts and Knowledges in the Intergovernmental Platform on Biodiversity and Ecosystem Services’, *Environmental Science & Policy* 57: 131–139.

Kutting, Gabriela and Lipschutz, Ronnie (2009) *Environmental Governance, Power and Knowledge in a Local Global World.* London: Routledge.

Larigauderie, Anne and Harold A. Mooney (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: 9–14.

Lazer, David (2011) 'Networks in Political Science: Back to the Future', *PS: Political Science & Politics* 44(1): 61–68.

Le Prestre, Philippe ed. (2002) *Governing Global Biodiversity, The Evolution and Implementation of the Convention on Biological Diversity*. Brookfield: Ashgate.

Lebel, Louis, Torsten Grothmann and Bernd Siebenhüner (2010) 'The Role of Social Learning in Adaptiveness: Insights from Water Management', *International Environmental Agreements: Politics, Law and Economics* 10(4): 333–53.

Lemos, Maria Carmen, and Barbara J. Morehouse (2005) 'The Co-Production of Science and Policy in Integrated Climate Assessments', *Global Environmental Change* 15(1): 57–68.

Lidskog, Rolf and Göran Sundqvist (2015) 'When Does Science Matter? International Relations Meets Sciences and Technology Studies', *Global Environmental Politics* 15(1): 1–20.

Martello, Marybeth Long (2004) 'Expert Advice and Desertification Policy: Past Experience and Current Challenges', *Global Environmental Politics* 4(3): 85–106.

Michaels, Sarah (2009) 'Matching Knowledge Brokering Strategies to Environmental Policy Problems and Settings', *Environmental Science and Policy* 12: 994–1011.

Miller, Clark (2001) 'Hybrid Management: Boundary Organizations, Science Policy, and Environmental Governance in the Climate Regime', *Science, Technology & Human Values* 26(4): 478–500.

Morin, Jean-Frédéric and Amandine Orsini (2014) 'Policy Coherence and Regime Complexes: The Case of Genetic Resources', *Review of International Studies* 40: 303–24.

Morse, Julia C. and Keohane, Robert O. (2014) 'Contested Multilateralism', *Review of International Organizations* 9(4): 385–412.

Muzaka, Valbona (2011) 'Linkages, Contests and Overlaps in the Global Intellectual Property Rights Regime', *European Journal of International Relations* 17(4): 755–76.

Newman, Mark E.J. (2004) 'Coauthorship Networks and Patterns of Scientific Collaboration', *PNAS* 101 (Suppl. 1): 5200–205.

Oberthür, Sebastian (2009) 'Interplay Management: Enhancing Environmental Policy Integration among International Institutions', *International Environmental Agreements: Politics, Law and Economics* 9(4): 371–91.

Oberthür, Sebastian and Justyna Pożarowska (2013) 'Managing Institutional Complexity and Fragmentation: The Nagoya Protocol and the Global Governance of Genetic Resources', *Global Environmental Politics* 13(3): 100–18.

Oberthür, Sebastian and Olav Schram Stokke eds. (2011) *Managing Institutional Complexity: Regime Interplay and Global Environmental Change*. Cambridge: MIT Press.

Olsson, Per, Carl Folke and Fikret Berkes (2004) 'Adaptive Co-Management for Building Resilience in Social-ecological Systems', *Environmental Management* 34: 75–90.

Ovodenko, Alexander and Keohane, Robert O. (2012) 'Institutional Diffusion in International Environmental Affairs', *International Affairs* 88(3): 523–41.

Paavola, Jouni, Andrew Gouldson, and Tatiana Kluvánková-Oravská (2009) 'Interplay of Actors, Scales, Frameworks and Regimes in the Governance of Biodiversity', *Environmental Policy and Governance* 19(3): 148–58.

Perrings, Charles, Anantha Duraiappah, Anna Larigauderie and Harrold Mooney (2011) 'The Biodiversity and Ecosystem Services Science-Policy Interface', *Science* 331(4): 1133–139.

Posey, Darrell Addison ed. (1999) *Cultural and Spiritual Values of Biodiversity*. London: United Nations Environmental Programme & Intermediate Technology Publications.

Radaelli, Claudio (1995) 'The Role of Knowledge in the Policy Process', *Journal of European Public Policy* 2: 159–83.
Rammel, Christian, Sigrid Stagl and Harald Wilfing (2007) 'Managing Complex Adaptive systems—A Co-evolutionary Perspective on Natural Resource Management', *Ecological Economics* 63(1): 9–21.
Raustiala, Kal, and David Victor (2004) 'The Regime Complex for Plant Genetic Resources', *International Organization* 58: 277–309.
Reid, Walter V. Fikret Berkes, Thomas J. Wilbanks and Doris Capistrano eds. (2006) *Bridging Scales and Knowledge Systems. Concepts and Applications in Ecosystem Assessmen*t. Washington: Island Press.
Rosendal, Kristin G. (2001) 'Impacts of Overlapping International Regimes: The Case of Biodiversity', *Global Governance* 7: 95–117.
Scott, Karen N. (2011) 'International Environmental Governance: Managing Fragmentation through Institutional Connection', *Melbourne Journal of International Law* 12(1): 10–13.
Seabrooke, Leonard (2014) 'Epistemic Arbitrage: Transnational Professional Knowledge in Action', *Journal of Professions and Organization* 1(1): 1–16.
Stokke, Olav Schram (2001) *The Interplay of International Regimes: Putting Effectiveness Theory to Work*. FNI report 14.
Stone, Diane (2013) 'Shades of Grey: The World Bank, Knowledge Networks and Linked Ecologies of Academic Engagement', *Global Network* 13(2): 241–60.
Sutherland, William, J. Toby A. Gardner L. Jamila Haider and Lynn V. Dicks (2013) 'How can Local and Traditional Knowledge Be Effectively Incorporated into International Assessments?', *Oryx* 48(1): 1–2.
Swanson, Timothy (1999) 'Why Is There a Biodiversity Convention? The International Interest in Centralized Development Planning', *International Affairs* 75(2): 307–331.
Swanson, Timothy and Ben Groom (2012) 'Regulating Global Biodiversity: What is the Problem?', *Oxford Review of Economic Policy* 28(1): 114–38.
Ten Kate, Kerry and Sarah Laird (2000) 'Biodiversity and Business: Coming to Terms with the Grand Bargain', *International Affairs* 76(2): 241–64.
Turnhout, Esther, Art Dewulf and Mike Hulme (2016) 'What Does Policy-Relevance Global Environmental Knowledge Do? The Cases of Climate and Biodiversity', *Current Opinion in Environmental Sustainability* 18: 65–72.
UNEP (2010) *Report of the Third ad hoc Intergovernmental and Multi-Stakeholder Meeting on an Intergovernmental Science-Policy Platform on Biodiversity and Ecosystem Services*, Busan, 7–11 June 2010, UNEP/IPBES/3/3.
UNEP (2012) *Report of the Second Session of the Plenary Meeting to Determine Modalities and Institutional Arrangements for an Intergovernmental Science-Policy Platform on Biodiversity and Ecosystem Services*, Panama City, 16–21 April 2012, UNEP/IPBES.MI/2/9.
Vadrot, Alice (2014) *The Politics of Knowledge and Global Biodiversity*. Abingdon: Routledge.
Visseren-Hamakers, Ingrid J., Bas Arts, and Pieter, Glasbergen (2011) 'Interaction Management by Partnerships: The Case of Biodiversity and Climate Change. *Global Environmental Politics* 11(4): 89–107.
Young, Oran R. (1996) 'Institutional Linkages in International Society: Polar Perspectives. *Global Governance* 2(1): 1–24.
Young, Oran R. (2006) Vertical Interplay among Scale Dependent Resource Regimes. *Ecology and Society* 11(1): 27–42.
Young, Oran R. (2010) 'Institutional Dynamics: Resilience, Vulnerability and Adaptation in Environmental and Resource Regimes. *Global Environmental Change* 20: 378–85.

Annex 1: Attributes of the ten most connected individuals

IPBES criteria		*Issue-areas*		*Scales*		*Epistemologies*		*Other criteria*		
Gender	*UN Regions*	*Expertise*	*IOs*	*Governance scale*	*Ecological scale*	*Knowledge systems*	*Profession*	*Functions*	*Country*	*Ecosystem*
Man	Africa	Environment Development Agriculture	Environment Development	National International	Species Ecosystem	Natural	Scientist Policymaker	MEP	Developing	Marine
Man	West E.	Environment Agriculture	Environment Development Culture	National International	Ecosystems	Natural	Scientist Policymaker	Bureau	Developed	Terrestrial
Man	Latin A.	Development Trade	Environment Development Agriculture	National International	Ecosystems	Social	Policymaker	Bureau	Developing	_
Woman	Latin A.	Environment Development	Environment	National Transnational International	Ecosystems	Natural	Policymaker	MEP	Developing	Terrestrial Marine
Woman	West E.	Environment Development	Environment	National International	_	Natural	Policymaker	Bureau	Developed	_
Man	Latin A.	Environment Development	Environment Development Agriculture Culture	Local National Transnational	Ecosystems	Natural Social	Policymaker	MEP	Developing	Terrestrial Marine Interactions
Man	West E.	Environment	Environment	National International	Species Ecosystems	Natural	Scientist	MEP	Developed	Terrestrial
Man	Asia	Environment Development Agriculture Culture	Environment	Local National Transnational	Species Ecosystems	Natural Traditional	Scientist	MEP	Developing	Terrestrial Marine
Man	Asia	Environment	Environment Development Culture	National International	Ecosystems	Natural	Policymaker	Bureau	Developing	Terrestrial Inland waters Interactions
Man	Asia	Environment Development Agriculture Culture	Environment Development Agriculture	Local National International	Ecosystems	Natural Social Traditional	Policymaker	Bureau	Developing	Terrestrial Inland waters

About the Authors

Jean-Frédéric Morin is an Associate Professor at Laval University, where he holds the Canada Research Chair in International Political Economy. Before joining Laval University, he was a professor at Université libre de Bruxelles from 2008 to 2014. His most recent research projects look at global regime complexes, transnational expert networks and policy diffusion in the fields of trade, intellectual property, and environment. His recent publications appeared in leading journals such as *International Studies Quarterly*, *European Journal of International Relations*, and *Review of International Political Economy*. His working papers can be downloaded from www.chaire-epi.ulaval.ca.

Sélim Louafi is a Senior Research Fellow at the Centre International de Recherche Agronomique pour le Développement (CIRAD, Montpellier, France). He is an agronomist by training and holds a PhD in agricultural economics. He has been working on the global governance of genetic resources for more than a decade, including as researcher at the Centre of Philosophy of Law in Louvain-la-Neuve in Belgium, as program manager at the Institute of Sustainable Development and International Relations (IDDRI) in Paris, and as senior officer at the Secretariat of the International Treaty on Plant Genetic Resources for Food and Agriculture (FAO). At CIRAD, he is part of a team of agronomists and geneticists working on science and policy interactions in the field of agricultural biodiversity. He was recently awarded a Marie Curie Outgoing Fellowship Grant to conduct research at the School of Public Affairs of Arizona State University.

Amandine Orsini is Professor of international relations at the Political Science Research Center (CReSPo) of the Université Saint-Louis - Bruxelles. She teaches courses on international relations, international organisations and European and global environmental politics. Amandine's research focuses on international environmental negotiations with work published in journals such as *Review of International Studies*, *Global Environmental Politics*, *International Studies Review*, *Critical Policy Studies*, *Global Society*, *Environmental Politics* and *Business & Society*. She recently edited two handbooks, *Essential Concepts of Global Environmental Politics* (2014, Earthscan), *The European Union with(in) International Organisations* (2014, Ashgate).

Mohamed Oubenal has a PhD in sociology from Paris-Dauphine University. His research interests include economic sociology, sociology of experts, and network analysis. During his postdoctoral fellowship in CIRAD, he studied the relationships between experts as well as stakeholders of the Intergovernmental science-policy

Platform on Biodiversity and Ecosystem Services (IPBES). As a postdoc in the ISCC, he performed mapping of scientific controversies. He is currently a research fellow in sociology at IRCAM in Morocco and associate researcher at the Observatoire des réseaux intra et inter-organisationels (ORIO) in France.