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Planetary Boundaries and Governance Mechanisms in the transition to the Anthropocene



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Complex Governance for the Anthropocene

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Abstract

The Anthropocene presents formidable governance challenges, not only in terms of the large uncertainties that surround the impact of humans on the biosphere, but also because it is occurring at a time of profound transformations in international politics. This article builds on the recent literature on complex systems and international environmental politics and identifies some of the core elements of thinking about governance in the Anthropocene. After a brief reminder of the characteristics of a complex system and the challenges that this poses to some of the existing doxa, it proceeds with a discussion of key elements of the system, of aspects of its operation, and of the goals that one should pursue in terms of system dynamics. Approaching the governance of the Anthropocene as a complex system allows us to shape much of current research in IR into a coherent whole, as well as identify the contours of a global international governance system of the environment that takes advantage of the dynamics of the system rather than courting failure by attempting to simplify it.

Keywords: Anthropocene, International environmental politics, Complex Governance

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Introduction

Its debatable scientific merit apart, three ideas behind the concept of the Anthropocene make it useful: (i) nature is no longer independent from humans (Pattberg and Zelli 2016); (ii) the latter have the power to shape its dynamics to the extent that it can endanger their ability to attain whatever is defined as social goods; and (iii) environmental changes reflect the evolution of societies and are embedded in a profound transformation of international politics. The Earth is new both in terms of the evolution of the biosphere and human-biosphere interactions (which changes our image of nature) and in terms of international politics, which demands new ways of approaching the international governance of environmental issues.

Although attempts to apply concepts from complex systems theory to international relations are not new—see, for example, Rosenau 1990, Jervis 1997, Harrison 2006, Kavalski 2007, Clemens (2013)—, scholars have struggled to translate its key concepts into a better understanding of the dynamics of international relations and draw policy implications from them. A spate of books, special issues, and articles have eloquently made the case for “embracing complexity” (Boulton et al. 2015), yet International Relations (IR) scholars have been slow to do so. The literature is long on general admonitions and short on specifics that might provide guidance in order to apprehend that complexity. The profession uses the vocabulary, but either forgets the supporting reasoning or rejects it outright as a potential paradigm of IR. At the same time though, new conceptual tools have emerged that respond to that need, even though they may not be integrated into a coherent whole.

Indeed, scholars have increasingly turned their attention to the problems raised by the behavior of complex systems, notably through the analysis of models of cooperation, non-linear dynamics, networks, regime complexes, boundary-organizations, or multi-scalar governance. In many ways, research has *de facto* moved towards responding to the challenge of apprehending a complex system. Intellectually though, the prevailing discourse, both in academia and politics, remains steeped in analytical linear thinking that emphasizes centralized authority and prediction. Complexity is seen as a challenge rather than as an opportunity. Nevertheless, many approaches to contemporary international governance are manifestations of or adaptations to complexity, such as the development of private governance, the rise of regions, network analysis, multi-level governance, or the emphasis on local participation in order to address potential non-linear effects, and on promoting a dialectical construction of the science-policy interface. These developments are conceived outside a complex intellectual framework, however. Rather, they seek to respond to temporary problems and are appended to linear frameworks. How can complex systems thinking help us redefine both the nature of the problems and its political solutions? How can it facilitate an international policy-oriented agenda? How can we reconcile what takes place at different levels of governance and foster synergies among them?

The purpose of this article is to sketch some of the core elements of thinking about governance in the Anthropocene in a complex perspective: what does it mean to speak of “complex global governance of the Anthropocene”? The Anthropocene is the result of multiple



factors, from technology, ideology, culture, consumption and poverty alleviation to a variety of domestic and international politics. My concern, however, lies in global governance where those factors converge.

Although it may sound like an oxymoron, governing complexity is far from being a new question (Jessop 1997). The very notion of governance, as articulated in IR, addresses the need to cooperate in solving common problems in the context of the fragmentation of authority and multiplication of actors. Thinking in terms of complex systems can help us identify the contours of a more relevant global international governance system of the environment. To that end, the article starts with a reminder of the characteristics of a complex system and the challenges that this poses in adopting new ways of thinking about international environmental issues. It then proceeds by looking at the elements of the system (part 2), its operation (part 3) and the goals that one should pursue (part 4).

1. The Challenge of Governing the Anthropocene in a Complex System

The Anthropocene, like many other concepts in global environmental governance, has first an instrumental value designed to raise awareness, mobilize decision-makers and citizens, and stimulate action in favor of more determined environmental policies coordinated globally. To be effective, the concept should be both intellectually fruitful and politically useful.

The Anthropocene is about the combined dynamics of natural and social complex systems each undergoing profound transformations. The notion of the Anthropocene goes beyond mass biodiversity extinction. It also encompasses the emergence of multiple disequilibria provoked by climate change as well as the disruption of the cycle of elements fundamental to sustaining life, such as nitrogen or the water cycle (Vitousek, Ehrlich et al. 1986, Vitousek, Mooney et al. 1997). The Anthropocene label thus points to irreversible dynamics under way that are the product of a system that can be characterized as complex. Apprehending it, limiting the scope of transformations within a reasonable time frame, building sustainable societies and ecosystems, and adapting to the impacts of the Anthropocene require new thinking. At the global level, the problem is particularly wicked, not only because it refers to nature-societies interactions that involve diverse actors, competing values and interests, and multiple uncertainties, but also because it emerges at a time of profound transformations of international relations.

Globalization has added uncertainty to the twin properties of interdependence: sensitivity and vulnerability. It increases the unpredictability of the system, for it means more actors, more linkages among issues, the existence of competing norms embedded in various regimes, and a multiplicity of forums (public, private, public-private) where norms and regulations are negotiated. Interdependence and globalization increase the uncertainty attached to (i) the meaning of events, (ii) the actions of other actors, and (iii) the consequences of one's own actions, which reflects the non-linear behavior of the system.



1.1 The nature of complexity

The nature of complexity and complex systems as applied to IR has drawn increasing attention (for example Harrison 2006, Kavalski 2007, Bousquet and Curtis 2011, Le Prestre 2017, Young 2017). Complexity eschews the simplification and reductionism of classical analytical thinking, which, although hugely successful, also lead to models that have difficulties describing and accounting for observed reality. To illustrate this shift of perspective, one distinguishes between the “complex” and the merely “complicated” (Morin 1990). A jet engine, which can be disassembled and reassembled at will, will work as intended if the engineers have calculated properly the characteristics of its thousands of parts and if the mechanics have assembled it right. It is very complicated. Something “complicated” can be solved by cutting it down into manageable parts. Complex problems, on the other hand, cannot be simplified without being strongly altered or “mutilated”, and their behavior is not predictable from the knowledge of their parts (Morin 1990). The world is not a machine. From a complex perspective, the right question is not how to make the current system less complicated by centralizing authority, but how to “harness” (Axelrod and Cohen 1999) the complexity of the system in order to heighten its effectiveness.

Thus, a system is complex when it has multiple and diverse elements of various types, intricately interconnected with one another (thereby forming networks), which, in turn, leads to feedback loops and nonlinearity. It is also open (exchanging information with its environment) and hierarchical in the sense that the behavior and properties of higher-level systems are rooted in what takes place at lower levels. Whereas political systems are commonly described at only one level of organization, “complexity theory provides a framework in which the relationships between constructs at different hierarchical levels can be accommodated” (Parrott 2002: 2).

Distinctive attributes have been associated with complex systems, notably (i) self-organization and self-regulation (order emerges naturally from unpredictable non-linear interactions among agents); (ii) emergence (the system is more than the sum of its parts: new and unexpected structures, patterns and properties arise; at any level of analysis, order is an emergent property of individual interactions at a lower level of aggregation, rather than explained by causal drivers at the same level of analysis); and (iii) adaptation (a notion that goes beyond access to resources in order to include «fitness» and co-evolution, and that includes the issue of learning).

For each of these properties, contradictory dynamics can take place within complex systems. For instance, like other systems, complex systems are subject to path dependency. The behavior of a complex system is contingent on the local context and on the previous sequence of events.¹ They also regularly present surprises and unexpected outcomes. While complex

¹ For example, decision-makers are victims of their past decisions, that is of past strategies of adaptation. Actors tend to continue resorting to a specific adaptive behavior unless strong negative consequences have been observed, and this even in the absence of positive data linking the strategy and the observed results.



systems might appear chaotic at first because of nonlinearity, feedback loops, and tipping points (where a system suddenly flips to a very different state), their adaptability means that they also know phases of continuity. Just as some highly diverse ecosystems can only persist over time thanks to disruptive events, complex systems constantly regenerate themselves after destabilizing situations.

Two other aspects are central to the application of a complex systems perspective to international relations. First, by definition, complex systems cannot be controlled by a single source of authority able to capture all significant interconnections, and even less control their outcomes unless they are drastically simplified (as is an agricultural system for example, or dictatorships). Second, in complex social systems, issues are not merely technical; normative and political dimensions are inherent to the process, leading again to the potential of multiple equilibria, as in the case of sustainability (Haas 2016).

Ironically, even though discourse and policies remain steeped in linear thinking, the actual world and research in international relations have moved beyond such models. Much current work on global environmental governance is removed from the traditional hierarchical and regulatory-oriented model, and includes models of cooperation under anarchy, the notions of regime complex and linkage diplomacy, the redefinition of the science/policy interface, the development of multi-scale governance, the dissemination of certain norms (such as participation), and new instruments of governance involving a plurality of actors (non-governmental organizations (NGOs), business, international organizations (IOs), cities and sub-national political units, networks, regions) that claim legitimacy in the development and implementation of international cooperation. A complex systems approach offers a potential overarching framework for integrating these new avenues of research, and it starts with shedding or contextualizing received ideas.

1.2 Challenging the governance doxa

Thinking anew requires challenging elements of the governance doxa that has been driving advocacy, policy, as well as much of scholarship. This doxa is rich in conclusions or pronouncements that pass for knowledge but become questionable under a complex system perspective. Thus, critics of the current governance system have bemoaned (i) national sovereignty, (ii) institutional fragmentation (leading, they believe, to conflicts over authority, a waste of scarce human and financial resources, a lack of coherence, and a heavy diplomatic and financial burden); (iii) a lack of consensus on the norms that should prevail and on what should be avoided first; (iv) interstate disputes regarding the nature of acceptable risks and the role of science; (v) the United Nations Environment Programme's (UNEP now UN Environment) struggle to play a leading role in environmental matters and, more broadly the relative decline of the United Nations (UN) in global governance; (vi) conflicts among regimes, such as between the environment, on the one hand, and trade, development, and human rights on the other; and (vii) and the lack of implementation of existing agreements mostly due to the weakness of most current agreements. Let us briefly discuss three of the most common received ideas: that global



problems require global solutions; that strong treaties are needed to ensure cooperation; and that centralizing authority through powerful international institutions is key to dealing with the consequences of the Anthropocene.

1.2.1 Do global problems always require global solutions?

At one level, one may argue that it is not the scale of problems but their nature that drives solutions. Global problems (such as ozone depletion or climate change), where nobody can escape being impacted, differ from worldwide problems (such as biodiversity loss), that may affect all states but whose solutions are essentially local, national, and regional. Global problems, though they may be collective action problems, do not imply, by that very characteristic, that their solutions must include all actors and all related issues. It is not because everything is related to everything else that everything and everybody must be part of the analysis and solution.

This does not eschew the need to search for a way forward at the international level and for coordinating approaches devised at lower levels, which explains why international fora and agreements are necessary. However, neither does it mean that all actors have to be included in the solution, accept similar norms, and adopt identical policies. Indeed, defining global problems as requiring global solutions leads to an all-or-nothing approach, to a rally around a lowest common denominator, and to higher risks of failure either through blackmail or through the refusal of actors to act alone. The key issues are what happens at the national level in key states, the prospects for the diffusion of these policies and norms both horizontally and vertically, and whether potential free riders can significantly jeopardize the effectiveness of the regime in the long term. Globalizing problems does not hide regional and national differences; it may even exacerbate them. The call to transcend the state tends to assume that there are universal solutions to global problems, thus negating the importance of the local. Indeed, a strong research agenda now focuses on regions and multiscale governance, that is the articulation of the global with local and intermediary levels of governance (see below).

1.2.2 Are strong treaties key to meaningful cooperation?

Another mantra, particularly popular with non-governmental organizations (NGOs) and legal scholars, is that to be effective, international environmental protection must rest on treaties that contain specific obligations and strong enforcement provisions. This belief calls for a few caveats.

First, compliance (that is, the extent to which parties fulfill their obligations) is not effectiveness (the extent to which the agreement helps change the behavior of relevant actors towards desired ends). States usually negotiate the obligations they believe they can fulfill and can be in compliance even though they have done nothing to implement the provisions of an agreement (Victor, Raustiala et al. 1998). Therefore, treaties that focus on compliance may miss the mark.



Second, this approach may assume the problem to be solved. If states are ready to accept strong measures that demand specific actions (with little room left for interpreting the obligations in light of their own circumstances) under threat of drastic sanctions, then those measures are probably not needed since all will be convinced of their value and none would have an incentive to cheat. The problem then moves from achieving cooperation among states to managing the coordination of national efforts.

Third, the search for stronger treaties may also make their conclusion less probable and reduce the possibility of future cooperation. States will not ratify an agreement without knowing the details of the sanctions for noncompliance (as the negotiations on the implementation of the Kyoto Protocol illustrated) and without being convinced that the process will be fair both in its spirit and in outcomes. The definition of a fair and equitable process is itself unclear and likely to be questioned.

Sanctions have to induce compliance and a gradual strengthening of commitments, rather than make the latter more difficult to achieve. In the case of the Kyoto Protocol, although notionally legally binding, they failed to guarantee the domestic implementation of commitments (particularly in federal systems) and also made it less probable that noncompliant states would later agree on a follow-up treaty. Treaties need to be flexible in order to adapt to specific implementation contexts that differ widely. For example, transboundary water issues require legal norms that can fit the characteristics of each case (Sohnle 1998). Finally, far from weakening international law, even a weak treaty may induce positive political dynamics within governments and civil societies that help disseminate norms and principles. It defines yardsticks for evaluating behavior, identifies a direction, and helps mobilize actors.

1.2.3 Powerful international institutions are not necessarily the answer

The belief in the virtue of centralizing authority at the international level is widespread. When it proposed the creation of “an IPCC for biodiversity” in 2005, which eventually became the IPBES, the French government envisaged “a single steering center that issues specific directives.”² This belief in the virtue of centralization often takes the form of a call for a World Environment Organization (WEO) from scholars (see Biermann 2014), NGOs, some governments, and Popes (from John XXIII to Francis).

This is largely a solution in search of a problem. Conflicts among regimes, such as between environment and trade, which a global authority would be expected to minimize, are not the norm. No economic provision designed to facilitate the enforcement of an international environmental treaty has yet been denounced in the WTO. The WTO itself is not opposed to using environmental concerns in decisions about trade, but it is concerned with the results of

² Renaud Dutreil, France’s minister of civil service, Address to the International Conference on “Biodiversity, Science and Governance,” Paris, January 24–28, 2005.



such decisions and with using trade-related environmental measures (TREMs) in a discriminatory fashion.

One should distinguish among different types of conflicts. Case studies, for example, suggest that normative conflicts among MEAs may be relatively few (Kim 2013, van Asselt 2014). Conflicts over resources and turf, on the other hand, are real, but again, studies other than anecdotes looking at the impact of these conflicts remain few. In fact, the system has evolved tools to manage them and synergies are possible, such as the potential synergies between Reducing Emissions from Deforestation and Forest Degradation (REDD) and the Convention on Biological Diversity (CBD) (van Asselt 2014).

More fundamentally, better coordination does not automatically follow geographical or administrative centralization in the absence of an overarching consensus on the norms and principles that should be promoted. This has a triple meaning: (i) current institutional diversity reflects the diversity of perspectives and interests at play; (ii) states hesitate to grant extensive powers to a single institution they do not control; and (iii) a WEO would, in effect, have difficulties speaking with one voice. This difficulty is enhanced by fragmentation at the national level among domestic groups, ministries and levels of government, which creates tensions that are enhanced by participatory and decentralization policies. Such tensions could quickly paralyze a WEO. If the latter manages to possess the authority and resources that its supporters would like, states will then be all the more eager to control its outputs: competition among different priorities could then quickly lead to stalemate or incoherence.

Indeed, the influence of most states (not to mention civil society) might be far more modest in a WEO than in individual regimes. Issue linkage may encourage successful bargaining over some issues but impede progress on others. It is unclear why such an agency would be better able to facilitate implementation of national legislation and international agreements, and the scope of its potential responsibilities might create new fears of green imperialism. Finally, nothing suggests that a WEO could demonstrate the ability to adapt and escape the ills of other large organizations, namely uncertain legitimacy, waste of resources, internal paralysis, incoherence of activities, and competition with other institutions. Faced with these obstacles, this solution has had little traction, and international environmental governance reform based on this premise has been trapped in quicksand.

Complex systems self-organize into emergent forms that cannot be predicted from an understanding of the behavior of their parts. The current premise, however, is the opposite and posits that effective governance stems only from the behavior of units (actors, regimes) and that the issue is some sort of centralized coordination (Biermann 2014). This is linear thinking. Faced with the dead-end efforts of the past thirty years to revamp the architecture of international environmental institutions, it has become urgent to develop a new model of governance. Rather than a centralized model predicated on editing norms, rules, and procedures at the global level, an alternative one should be articulated that rests on the new dynamics of international politics, that is on the development, control, and harmonization of various governance networks, on regional differentiation, and on the integration of various levels of governance. In this context, three type



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of questions arise pertaining to (i) the role of the elements of the system (section 2), (ii) the operation of the system (section 3), and (iii) the goals to be pursued (section 4).

2. Rethinking the elements of the system

2.1 The nature and multiplicity of the elements of the system

Though it remains dominant, the state now governs in alliance with other actors with whom it shares legitimacy. The latter have multiplied, sometimes thanks to the states themselves, and have even spawned new ones. Just as international organizations beget international organizations (Johnson 2014), NGOs beget NGOs, and networks beget networks.³ In complex governance, neither the actors, their type (public, private, hybrid) or nature (unitary or not), nor their preferences are given. Indeed, the importance of networks compels us to see actors as non-unitary. Preferences are constructed from roles which stem both from the actors' location in the system and from their identities. Just as in domestic politics, international governance of the Anthropocene rests on harmonized and coordinated interactions among a variety of actors that act as partners while pursuing different interests.

Globalization, trade, and environmental concerns have made it impossible to separate domestic and external issues. As the number of relevant and legitimate stakeholders increases, so does uncertainty, but so do avenues of action and agreements among a variety of actors acting independently from the state. For example, the Pope and the mayors of large cities signed a declaration on climate and human trafficking in July 2015. Before the Paris climate accord of 2015, local authorities were the only international level of governance where agreements were concluded committing them to long-term action against climate change. Between 2000 and 2010, cities have organized into a network of networks on environmental issues, and have established themselves as a strong voice on climate change.

These actors, be they central government units, sub-governments, business, civil society groups, IGOs, form transnational networks and coalitions around which politics coalesces. They also operate at different scales. The challenge for governance is not only to understand the interaction mechanisms between different levels (Rosenau 1990), but also to allow for the construction of an intersubjective world that enables the mobilization of actors engaged in the definition and the implementation of various institutions that define a regime complex. This transformation of former subjects of international governance into stakeholders and partners, therefore, implies the development of participatory politics where stakeholders are associated with international discussions and problem framing, with the search for solutions, and with their

³ For example: the UN General Assembly established the United Nations Environment Programme (UNEP) which was behind the development of several MEAs with their attending secretariats; the International Union for the Conservation of Nature (IUCN) created the World Wildlife Fund (WWF) that in turn founded TRAFFIC (the wildlife trade monitoring network); the International Council for Local Environmental Initiatives (ICLEI) led to the creation of the Cities for Climate Protection network (CCP), etc.



implementation. This points to the new dialectical relationship between science and policy, to the importance of retaining multiple points of access rather than centralizing authority, as well as to strengthening the capacity of certain coalitions of actors to move at different speeds.

Finally, networks as governance units comprising agents interacting nonlinearly and holding specific ways of apprehending the world (Wells 2009) lie at the heart of the governance of complex systems. The formal analysis of network (as opposed to the recognition that networks may be important new actors (Keck and Sicking 1998, Reinicke 1999) has consequently gained increased though belated popularity (Hafner-Burton, Kahler et al. 2009, Maoz 2011), particularly in the study of international finance, trade, or the environment.

Agents form networks based on their nature or purpose. The diversity of interactions among the different agents of global environmental governance is illustrated by the variety of hybrid networks that associate public and private actors (Dubash and Florini 2011). New forms of collaborations between various types of authorities (public, private and market) have given rise to a multiplicity of decentralized governance strategies (Lemos and Agrawal 2006): co-management (between state and community); outright delegation of authority (as in the management of protected areas delegated to NGOs); public-private partnerships (between state and market); private-social partnerships (between community and market); or private authority (between firms and NGOs). These new forms of collaborations, with “uncertain accountability mechanisms” (Smouts 2003, Dubash and Florini 2011), are complemented by intra-networks governance strategies such as the development of industry-wide guidelines.

Future international relations will increasingly involve the interplay of agents and their networks with hybrid networks of coalitions. Policy networks are particularly interesting in the context of global environmental governance. Examples are the Consultative Group on International Agricultural Research (CGIAR), the World Commission on Dams, the Global Water Partnership, the Roll Back Malaria Campaign, and the International NGO Desertification Network (RIOD). In this regard, networks have a key role to play in linking various governance levels, from the local to the global, or between regions either directly or through international organizations.

2.2 Rethinking the role of international organizations (IOs)

As arenas where various actors interact, IOs play a key role in the transformation of the Westphalian system into a complex system. The recent literature on international organizations has devoted a lot of attention to the role that IOs play or should play. March and Olsen (1998) suggest two ways through which international institutions may affect system change: shaping identities and capacity-building (March and Olsen 1998). The question of the functions that IOs play has two aspects of interest here: the first one is the twin issues of densification and fragmentation; the second one pertains to their role.

Densification has usually been seen as a problem to be overcome, and the notion of interplay among institutions (be they individual organizations or regimes) has spawned an active scholarship based on the assumption that the fragmentation of authority among international



institutions governing the environment is basically dysfunctional (Oberthür and Stockke 2011). From the viewpoint of regime complexes, Alter and Meunier (2009) have identified both positive and negative aspects, of densification of IOs on the behavior of agents, although their relative importance and what really constitutes a positive and negative impact of actors' behavior is very much open to debate. Complexity promotes dynamics that increase actors' strategic options, which may or may not be viewed as negative. For example, one may deplore or welcome that it leaves states significant latitude to interpret their obligations, thanks to forum shopping or through strategic inconsistency (where actors intentionally create conflicting rules in different forums so as to widen their options), or even that it facilitates exit via non-compliance, regime shifting, or withdrawal from IOs (Alter and Meunier 2009).

This applies to other actors as well. Whereas traditional students of regime interplay and international institutions deplore competition among institutions and actors, it can have both negative (such as turf battles and a failure to coordinate efforts) and positive effects (increasing total resources, spreading risk, allowing experimentation) (Alter and Meunier 2009). The same holds true for the emergence of small groups, which may both increase trust and promote groupthink.

Densification is not *ipso facto* negative. As in ecosystems, one should build upon diversity rather than try to reduce it, and thus favor decentralized authority. In this view, for example, MEAs of the biodiversity cluster are not a problem of institutional fragmentation, but adaptive features that may encourage effective governance through experimentation (Haas 2004, Harrison 2006, Jordan et al. 2018). Moreover, rather than focusing strictly on MEA secretariats, the more appropriate unit of analysis should be the convention governance system itself, that is the system of actors, norms, and interrelationships created by international regimes, of which secretariats constitute the administrative and coordinating unit. These units of evolution and adaptation are mission-oriented institutions, as opposed to management-oriented ones: more flexible (depending on their relationship with UNEP) and better able to learn, thus fostering the adaptiveness of the system.

Second, although we need institutions, these do not have to take the form of IOs. Karns (2017: 342) has urged us to need to "think more seriously about how to deal with the decline or disintegration of IOs and with changes in global governance arrangements that result from domestic shifts within major powers, the emergence of new power centers and actors, and unanticipated crises". At the same time, Young (2017: E4102) insists on the need to make "a concerted effort to design institutional arrangements to address needs for governance in a manner that is tailored to the key features of the relevant issue areas, that takes advantage of opportunities to find roles for existing players, and that minimizes the need to build intergovernmental organizations that are costly to operate and likely to fall prey to a variety of bureaucratic problems."

Third, IGOs must be seen as open systems themselves that is "systems of interdependent activities linking shifting coalitions of participants" (Baum & Rowley, 2005 quoted in Ellis 2010). In this regard, network analysis should prove particularly useful when IOs are viewed not as



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putative command-and-control organizations but as "networks of interdependencies" (Karns 2017).

The question of their scope has both a geographical and a functional aspect. First, IOs may be further decentralized. In some respects, for example, the WHO is actually a federation of regional health organizations,⁴ which in some cases even predate the formation of the WHO itself, operate fairly independently and have their own relationships with donors. With respect to their functional scope, co-evolution may lead to the development interdependence or to the construction of niches (Abbott, Green et al. 2016) as a way of dealing with competition. Each path entails a trade-off. In the case of interdependence, it is between maximizing access to resources at the expense of autonomy associated with increased vulnerability. In the case of specialization, it may be a gradual lack of fit with the evolution of the environment and a movement to an evolutionary dead-end.

In a complex perspective, the role of universal IGOs moves from one of norm setting and regulation to coordination, harmonization, and orchestration. To be sure, some would like their functions to be "to construct the social world in which cooperation and choice take place and to help define the interests that states and other actors come to hold" (Barnett and Finnemore 2004: 162), which they would carry through intellectual leadership by gathering and filling knowledge gaps, or setting and monitoring objectives such as development targets. Current dynamics are different, however. These functions, if they are performed at all, may be the result of networks operating through them, or be thrust upon them from other levels of governance (such as the regional level), or be performed by different types of IGOs (concerts rather than universal IGOs, boundary-organizations or mission-oriented ones).

The concept of "orchestration" (Abbott, Genschel et al. 2011, Hale and Roger 2014) is a convenient way of referring to some functions that IOs have been deploying for some time but now pursue much more actively. It corresponds not to an expansion of their role-set but rather to its transformation. IOs find themselves at the center of networks of actors of various types that flow through them, that they sometimes help create and associate to the governance of an issue-area, thus helping put in place a system of "transnational new governance" (Abbott and Snidal 2010) that they do not control, however. In a way, IOs become catalysts of actions undertaken by other actors in partnership or not with them, and forums where actions are harmonized, rather than central regulating operators within a hierarchical authority system. In particular, Abbott & Snidal (2010: 323) see this evolution as "a fundamental shift in the role of IOs and states in global governance, from traditional forms of regulation" to support for private governance, and finally to more direct roles as "orchestrator and participant" in a system based on collaboration among diverse entities.

⁴ These six regional offices are: Africa (AFRO), Eastern Mediterranean (EMRO), Europe (EURO), the Americas (AMRO), Southeast Asia (SEARO), and the Western Pacific (WPRO).



To be successful orchestrators, however, IOs must have some degree of autonomy (or else a mandate from member states) and the capacity to coordinate private actors and schemes. On the one hand, organization theory warns of a trade-off between organizational adaptation, key to the dynamics of complex systems (see below), and autonomy. On the other hand, there is a growing literature that argues that IOs enjoy some freedom of action based on their legitimacy, differences in worldviews and interests among their members, on their capacity to build clienteles and mobilize civil society through non-state actors, on their control of expertise or on the latitude of their mandate, or on the willingness of their principals to grant them some degree of independence (Abbott and Snidal 1998, Nielson and Tierney 2003, Barnett and Finnemore 2004, Hawkins and Lake et al. 2006). This leads to a wider rethinking of multilateralism.

2.3 Rethinking universal multilateralism and the role of the regions

When discussing the evolution and role of multilateralism in the complex governance of the Anthropocene, one must first distinguish between the process (traditionally consultation and concertation among at least three parties) and its embodiment, such as IOs and other structures (clubs, concerts, fora, etc.). In both cases, it is opposed to unilateralism, imperial hierarchy, bilateralism, or nationalism (Caporaso 1992). In practice, however, multilateralism is often reduced to the UN, and thus to universalism.

Multilateralism is largely understood as the willingness to use international organizations, be they universal or regional, or to handle issues in a multilateral setting, from ad-hoc coalitions to clubs, regional arrangements, inter-regional cooperation, all the way to universal organizations. Some would go farther and see it as a virtuous mode of governance based on shared norms, principles, and rules that govern relations among states (Hampson and Heindecker 2011). According to Ruggie (2012), multilateralism is a way of implementing general principles of conduct whereas bilateralism approaches issues on a case-by-case basis. No longer is it a mere means to pursue certain goals; it now has intrinsic value, which leads to debates on the role it should play and the forms it should take. Supporters of this approach emphasize its legitimacy, its potential to handle interstate issues equitably, and the primacy of rule-based over power politics (Ruggie 1992).

Though universal multilateralism may be facing deep challenges, regional multilateralism is lively. The current travails of multilateralism do not stem solely from a return to unilateralism on the part of one great power or from a reversion to nationalism in several countries; they are also a manifestation of the gap between the evolution of the international system and traditional conceptions of multilateralism. Instead of a questioning of multilateralism, it might be more appropriate to speak of the experimentation of different modes of governance likely to be more flexible, legitimate, and effective, reflecting both the diversity of the issues at play and the decentralization of power and authority in the system (Jordan et al. 2018).

In a context where uncertainty and surprises dominate, regions become a useful instrument of complex multilateral governance (Bäckstrand 2008), "laborator[ies] of an international system in the making" as Nguyen (2012: 60) has called them, with some of them



ambitioning to become gradually one of the attractors of this new multilateral system. In this context, regional organizations no longer act as mere relays of what takes place at the universal level, but are arenas where specific approaches to global problems are articulated based on the particular sensitivities, experience and modes of cooperation of their members.

Even though the principle of common but differentiated responsibilities attenuates them, the rules of universal multilateralism focus negotiations on the search for strategies applicable to all states, leaving their specific implementation to other levels of decisions, including the regional one. This globalist approach reached a dead-end in the case of climate change, which has masked the potential of regional governance as a pillar of global action. Some have judged the Kyoto Protocol and the Clean Development Mechanism as fundamentally unfair, while others have questioned a western model based on science, the state, and the market.

In opposition to a disembodied and homogeneous policy space, the region is where local cultures come to life. Although environmental issues and globalization encourage a convergence of norms, globalization also gives rise to a reaffirmation of local and regional identities. A regional perspective links the movement towards a global community around norms and governance processes (more transnational than supranational) to political dynamics that emerge from the concerns and perspectives of domestic civil societies. Being the locus where decision-makers and experts meet societies, regions can become laboratories of a new democratic model at the global level.

Building on Cox (2002), Amitav Acharya (2014) has elaborated on this perspective with the notion of "pluralistic universalism" that emphasizes the need to formulate, understand, respect, and exploit the existing diversity of multilateralism rooted, in part, in regional specificities and differences in political cultures. This requires, for example, fine-tuning data collection and interpretation, as well as the conclusions one draws from them. For example, the Intergovernmental Science-Policy Platform on Biodiversity and Ecosystem Services (IPBES) released four assessments in 2018 that divide the world into four regions (the Americas, Asia and the Pacific, Africa, and Europe and Central Asia) allowing for the specific threats (and conceptions of the threat) to biodiversity in each region to be made more apparent, leading potentially to the articulation of location-specific policy responses.

Global governance does not entail the weakening of states, which may form power concerts. Through the study of four cases (the internet, genetically-modified organisms, intellectual property rights (IPR) and public health), Drezner (2007) has shown why a great power concert is a necessary and sufficient condition for effective global governance. His argument is not limited to states' actions and takes into account the role of IOs and NGOs, and argues that domestic actors shape states' preferences. More specifically, studies of the G7 and G20 by Kirton and Kokotsis (2015) have highlighted the more conclusive contributions of concert governance and small group negotiation over the UN with respect to leadership and commitments to clean energy and addressing climate change, thanks to the limited number of participants, greater political cohesion, status recognition, and direct political control.



3. The Operation of The System (Processes)

3.1 Self-organization

Self-organization refers to order emerging naturally from unpredictable nonlinear interactions among agents. These patterns result from a bottom-up process rooted in the interactions of the agents. The form these patterns take cannot be predicted, and they may or may not "accord with an overarching principle such as maintaining stability and control, maximizing profits, or minimizing energy consumption" (Boulton et al. 2015: 17). Self-organization is a response to uncertainty. This is evident in the multiplication of clubs, in governance partnerships, in the rise of regimes and the dissemination of norms, or in the delegation of authority granted to NGOs in implementation and monitoring. Climate change governance provides a powerful example of self-organization with the development of governance schemes, transnational action networks, and the multilateral negotiating fora (Jordan et al. 2018).

The establishment of regimes and specific convention governing systems dealing with biodiversity can be approached as example of emergent self-organization. Although interests matter, MEAs cannot be deduced from the aggregation of "states'... conceptions of their own interests" (Michell 2003: 97) when preferences can be unclear and unstable in environmental arenas in which knowledge is uncertain, issues are complex, and material interests are "weakly or ambiguously affected" (Ibidem). The timing and content of MEAs are influenced by the strength of states' interests in environmental protection relative to other concerns and by their power to promote those interests, by the knowledge and discourse that structure perceptions of environmental problems and their solutions, and by the efforts of individuals and groups in proposing solutions and pressing governments to reach a given agreement (Idem).

Every regime symbolizing a combination of specific standards, interests, power and knowledge, forming a specific governance system, is evidence of self-organization. Regime complexes, as arenas where rules are negotiated and implemented, can also be seen as higher order dynamic attempts at self-organization. Other examples include private governance, tripartite governance among IOs-States and private actors, or policy networks. As in ecosystems, one should build upon diversity rather than try to reduce it, and favor decentralized authority.

3.2 Rethinking the rules of the system and the bases for political action

Actors do not have absolute freedom of behavior. It is easy, from there, to argue in favor of strengthening international law within a universalistic perspective, forgetting along the way other types of institutions. One example of this aspiration is the current campaign in favor of a global environmental pact. Focusing on the production of legal rules for their own sake may be counter-productive, however. Actors are also constrained by expectations, internal dynamics, networks, the distribution of power, the behavior of other units, as well as their own conception



of their role. Though treaties and regimes embody the rules of the system and are key, so are other systems of rules (institutions) that may be more informal.

The aim is not to produce rules but steer behavior. Goal-setting, therefore, is key (Young 2017), whereas the rules devised to achieve them are pluralistic. There are many ways of reducing carbon emissions depending on local or regional conditions. What is important are that the principles underlying these actions are shared, what Young (2017) has called "principled governance".

A complex systems perspective also requires thinking anew about power, authority, accountability, and legitimacy. In a complex system, the issue is not to determine which units or agents are dominant and able to resist change, impose policy directions, or affect outcomes; nor does power stem from asymmetric relationships as in complex interdependence. Rather, power is distributed and resides in the capacity to mobilize and form coalitions around a given discourse about the nature of the problem and of acceptable solutions, not in the retention of information but in the capacity to make sense of it and relay it. Policy networks, mentioned above, are particularly interesting in the context of global environmental governance. Oran Young's concept of institutional bargaining becomes particularly relevant: "Institutional bargaining focuses on building coalitions of those willing to contribute to the supply of public goods rather than on reaching agreement on mutually acceptable outcomes located at specific points on contract curves (Young 2017, E: 640).

Although authority can indeed be a simplifying force (Earnest and Rosenau 2006) through which agents reduce uncertainty at the cost of some autonomy, the contemporary foundations of authority are diverse and embedded in a variety of actors that claim and sometimes enjoy authority in their respective spheres, which the concept of polycentricity captures well (Jordan et al. 2018). Active participation on the part of a single dominant actor (commonly known in regime analysis as a hegemon) is not a necessary condition for success in solving international environmental problems (Young 2017). In addition, formal authority and power may not coincide, as organization theorists have shown. One of the functions of boundary organizations is indeed to manage the interactions among these different spheres of authority and power. Distributing authority, resources and capacities across multiple institutions may enhance relevance, flexibility, and legitimacy in dealing with complex governance of issues such as biodiversity (Koetz, Farrell et al. 2012).

However, if authority is fragmented and if power is based on process and interactions rather than status or capabilities, what happens to accountability? Can any actor be held responsible for the observed outcomes if the latter are the fruits of nonlinear processes? Already, coalitions among private actors have raised the issue of the democratic deficit of private governance (Smouts 2003). More specifically, how to ensure that non-state actors are held accountable, and to whom? Does it mean that business and sub-state actors should be brought more fully into dialogues with governments around climate change, for example? Participation and co-management cannot be divorced from accountability (for a further discussion, see Biermann 2014).



Politics becomes the struggle over the range and limits of fractal authority, and global ecopolitics revolves around their identification, legitimacy, and relationships, as well as the search for self-organization in order for cooperation and effectiveness to emerge. This leads to the questions of where to locate various instruments of governance (see, for example, the subsidiarity principle of the EU), and how to manage interscalar relations.

3.3 The system is a product of the past but history is a poor guide to the future

Path dependency means that history matters and constrains behavior. Global environmental governance has a history, and this history matters. Although distinct phases of evolution can be distinguished since the end of the 19th century in terms of dominant actors, problems, values, and objectives, each phase retains characteristics of the former to which new ones are added, thus rendering it more complex. Complexity increases with the number of agents, the links among issues, and the evolution of norms, knowledge, and technology, among other factors.

Path dependency means that current institutions will shape future governance systems (March and Olsen 1998). One never starts from scratch. UNEP's weak resources bear that out to the point where global environmental governance has often been equated with merely strengthening UNEP or replacing it with a new World Environment Organization (WEO) (Biermann 2014). In addition, the very existence of UNEP has triggered new arrangements designed to bypass it, with states preferring to create new entities (such as the former Commission on Sustainable Development) or to marginalize it (as in climate change). For example, the creation of the Intergovernmental Panel on Climate Change (IPCC), followed by the negotiations of the UNFCCC and the establishment of its secretariat, represent a string of conscious decisions not to give it more executive authority (von Moltke 2001). This was by some extent motivated by the fear of creating a powerful international environmental agency, a recurrent fear in the history of UNEP (Ivanova 2017). Although they are politically and financially independent from it, relations between UNEP and several biodiversity-related conventions administratively under UNEP, have been tense over the years, further encouraging MEAs to form coalitions of their own.

Not only does what happened before matter, but the order of events in which it has occurred is important in shaping the current governance system (Boulton et al. 2015: 41). The system has a history. In that regard, a specific aspect of path dependency is the issue of sensitivity to initial conditions. Biodiversity-related IGOs, for example, embody the norms, technology, and political relationships that prevailed at the time of their creation, and these will continue to inform their behavior as long as the nature of the membership and of the human resources remains the same. But because of other properties of the complex systems that allow for non-incremental change, the behavior of the elements of the system (agents) at time $t+1$ is not predictable, although the structural state may be (as in a warming liquid: we can predict the future state of the system—say evaporation—but not the individual behavior of the molecules).

The point between predictability and unpredictability of the elements is a “bifurcation” (Prigogine 1997) where the system may go different ways. The future becomes structurally



different from the past. Understanding these bifurcations is one of the main challenges we face (Young 2017). Species extinctions, for example, are the ultimate examples of irreversibility, and ecologists have long strived to identify both the nature of tipping points and the processes leading up to them (with the notions of minimum sustainable gene pool, keystone species, etc.), as well as their impacts. The notion of critical boundaries is predicated on the need to identify potential tipping points before the earth system enters a new phase state with devastating consequences on societies.

Unintended consequences, of course, directly stem from nonlinearity. Ecologists have long integrated the possibility of surprises into their models. Policy analysts have more difficulty doing so. Linear thinking is present when one looks at the new IPBES as a way of improving existing performance through the coordination of a scientific consensus around the protection of biodiversity. However, the IPBES also represents a disruptive innovation as it tries to define for itself a new niche, thereby forcing units to adapt (such as MEA subsidiary scientific bodies) and changing the relationships within and between regimes and system attractors.

4. The Goals That One Should Pursue

One of the major impediments to thinking anew about global governance from a complex systems perspective has been to go beyond vague admonitions and translate them into policy guidance. What should we do differently? How can complex systems thinking facilitate a policy-oriented agenda? How can we reconcile what takes place at different levels of governance, and how can we foster synergies among them?⁵ Many approaches to contemporary international governance already reflect an adaptation to complexity, such as insisting on local participation in order to address potential non-linear effects (Clemens 2013), or promoting a dialectical construction of the science-policy interface. These developments are conceived outside a complex intellectual framework, however. Rather, they seek to respond to temporary problems and are appended to linear frameworks.

The obvious starting point, therefore, is to "embrace complexity" (Boulton, Allen et al. 2015) rather than fight it. Complexity is inevitable. Rather than try to reduce it as the traditional analytical approach would do, one should acknowledge it and consider its properties in the design of governance institutions. Complexity leads to new definitions of the problem and ways of approaching solutions. There are no real solutions, only responses that will engender new challenges. Issues are managed but not controlled or solved. Although many aspects deserve to be discussed in this context, we shall take up two key aspects of this issue: the goals to be pursued and adaptation.

⁵ This discussion is limited to the dynamics of the system. The associated issues of effectiveness, accountability, and equity are also central to thinking about international environmental governance (see Biermann 2014, Young 2017, Le Prestre 2017).



The first aspect pertains to stability, that is, maintaining the essential properties of the system, including its components, within an acceptable range over time. In a complex system, however, not only are oscillations important, tipping points or bifurcations become a central concern (Young 2017), for they entail a change in the fundamental structure of the system. These "tipping points" have been a central concern of researchers in climate and biodiversity sciences.

Stability differs from equilibrium and stasis. Simple systems usually are static and tend to equilibrium; complex systems are always dynamic and dissipative (Prigogine and Stengers 1984). The issue is not to avoid positive feedbacks, which, as Resnick (1997: 134) has pointed out, are not always negative. Indeed, biodiversity policy aims at creating synergies (or positive feedbacks) among sectoral policies and policy instruments. The diffusion of new values regarding humans' relationship to the natural world will, it is hoped, benefit from similar dynamics. Likewise, tipping points are approached negatively not so much because they represent a qualitative change of the system, but because they appear suddenly, thus preventing smooth adaptation.

Thus, the issue is not to try to avoid perturbations (indeed the latter may be inherent to the stability of the system as are recurrent fires in grasslands), but anticipate them and build the conditions for resilience. Although composite systems (such as the global biodiversity governance system composed of units of different kinds) produce more minor events than catastrophes, chain reactions of all sizes are an integral part of the dynamics of large interactive systems. Composite systems never reach equilibrium; rather, they evolve from one stable state to the next, each phase containing dynamics that will inevitably transform it.

We must then think first about the system before acting on it (Meadows 2008). The issue is not only normative but also structural. This to be sure, is not new: many environmentalists have blamed the nature of political and economic institutions for the ecological crisis since the 1960s; but one keeps underestimating the extent to which the nature of the system shapes behavior. We should first identify those relationships that reduce policy effectiveness (understood as impediments to behavioral change) and lead to undesirable results, then change them, rather than cast blame (Meadows 2008). The environmentalist discourse, however, is often long on preaching and fond of advocating for individual or institutional redemption. This means, for example, balancing those feedback loops, whether positive or negative, that are associated with outcomes one wishes to avoid.

In complex social systems, it is the relationships among units and the functions that the system performs that matters. In ecology, what survives is not the single species, but the ecology or community of flora and fauna that are adapted to the prevailing conditions (Boulton et al. 2015). In anthropology, it is the function it performs, not the rite, the tradition or the specific taboo that matters. Likewise, one would emphasize co-evolution dynamics among actors (referring to institutional and policy diffusion, or to the emergence of co-dependence) and the evolution of their interactions. It is in that sense, that the issue of resilience, a property of the system, should be approached; it is not simply the ability of resisting external shocks, or bouncing-back after a disturbance (Chandler 2014), but the maintenance of basic properties and functions over time, and the development of new ones that make adaptation more likely. A



resilient system is not static, it evolves. As it does, its future state cannot be predicted because different causes can produce the same effect and conversely, similar causes, different effects; but the range of possible states can be. We may not be able to predict the future, but we can limit the range of possible outcomes and control for their consequences (Young 2017). A complex system approach, then, insists on trying to anticipate rather than predict.

Since complex systems cannot be controlled, context matters. We should then opt in favor of adaptive management (Holling 1978) characterized by flexible policies and the plurality of views that inform it, since no particular epistemic community can possess all the necessary knowledge to form policy. Science, models, expert knowledge, and the policies based on them are not interpreted as ultimate answers but merely as a means to guide a cautious process of intervention in complex ecosystems. The goal of management shifts from achieving a single target to an integrated view of maintaining ecosystem and social resilience, avoiding for example, catastrophic and irreversible “flips” to undesirable stable states. The twin objectives are to build institutions capable of learning and able to adapt. These conditions must be present at the level of the agent (since learning takes place there), but the system must also be designed to facilitate learning and adaptation.

Learning is based on designing feedback loops into the system. One example is the Montreal protocol and its procedures of revision of the range of chemicals covered by the protocol and its amendments and parties' commitments. At the unit level, say IOs, this leads to the development of new links, the adoption of new goals, a change in policies, internal reorganization, or the restriction or expansion of the policy domain. If treated as possessing agency and autonomy, IO adaptation could be researched from the perspective of organizational learning (Levitt and March 1988, Haas and Haas 1995, Argyris and Schön 1996), and one should encourage the development of mission-oriented organizations (see *supra*).

The denser and more diversified the networks, the higher the probability of collective and individual learning. This does not eschew the state: this new consensual knowledge must be accepted and advocated by a coalition of hegemonic member states. Orchestration mentioned above, through the mobilization of non-state and sub-state actors, may also prove to be a good instrument of collective learning. So is multilateralism that encourages norms harmonization and allows participants' visions of a given problem to converge. Learning rests on the capacity to develop shared conceptions of what is known and must be known, on the existence of stable coalitions of actors, and on leaders. It also entails (i) the development and coordination of knowledge networks, (ii) the creation of arrangements that strengthen transparency and the dissemination of information and allow for feedback loops from a variety of actors, and (iii) strengthening the capacity for error correction through extensive evaluations of actions that have been undertaken.

Learning is rooted in pragmatism which becomes the guiding approach of complex governance, conceived as “an on-going process of problem-solving, deliberation, experimentation, sedimented over time as experience, identity, habit, skill, and knowledge” (Geyer and Ansell 2016: 5). It recognizes that problems are not given but socially constructed,



that values are contextual and that they spring from deliberation, and that experimentation is the only way of dealing with the inherent uncertainty of the world (Idem).

From there, complexity will shape the type of adaptation strategies that actors can use and affect their outcome. As Jessop (1997) points out, all governance systems "are prone to failure" if they do not evolve, because the targets and goals of governance evolve, the environment is turbulent, "competing governance projects for same object of governance" develop, and norms evolve regarding the handling of governance trade-offs. A complex adaptive system (CAS) has the capacity to learn from and adapt to its environment over time, especially when this environment also consists of like systems (Holland 1998). It is because the system is populated with agents that seek to adapt to their environment that we can speak about an "adaptive system." In the sense in which it operates (the inclusion of non-state actors in the governance of the CBD and the role of cities, the development of private governance, the creation of IPBES, the development of new concepts and new knowledge (however debatable they may be) such as ecosystem services, offsets, and "nature-based solutions"), the biodiversity regime complex can be approached as a CAS.

This understanding of system adaptability leads to two major points (Axelrod and Cohen 1999). First, CAS theory is used in cases where agents are capable of selecting adaptation strategies: agents select strategies, not outcomes because the system intervenes (changes in behavior can lead to no real advantage or payoff for the agents). Second, adaptability is first an attribute of the agent, not of the system as a whole (strictly speaking, the outcome is adaptive, but the system does not adapt per se, it evolves). It means that even if agents are successful in their individual adaptation, by no means can we infer that the global performance of the system will tend to cooperation and effectiveness. On the other hand, only if agents adapt can the system be adaptive.

Although adaptation is neither automatic nor universal, examples of it exist in each class of actors. As autonomous agents, IOs active in the environment have repeatedly proven capable of adaptation, such as the World Bank (changes in goals, norms, procedures, and policies), the Ramsar Convention (transformation of its mission), the Convention to Combat Desertification (CCD) (institutional innovations), or the International Whaling Commission (IWC) (changes in norms and rules). One example is the emergence of compliance governance systems at the convention level.

The CBD has gradually evolved such a system unforeseen by the convention. The evolving reporting system and various means of evaluating the national implementation of international agreements hold the potential for regime learning, for modifying the MEA's programs of work, and for devising new policies in order to improve the implementation record. States have changed or reversed policies. NGOs have formed transnational advocacy coalitions (such as the World Commission on Dams).

Business provides a good illustration of this adaptation. Historically, business actors have tended to oppose national and international environmental regulations, seen as limiting their



competitiveness. To prevent adoption of constraining international regulations, they favored acting at the national level first. The 1992 Rio Conference on Environment and Development marked the beginning of a strategic change that took two forms: (i) an increased and more direct participation of the private sector in international environmental negotiations, and (ii) the development of innovative forms of governance, such as voluntary guidelines or certification schemes. Examples include the International Organization for Standardization (ISO 14000), the Forest and Marine Stewardship Councils, as well as various codes of conduct (Coalition for Environmentally Responsible Economics [CERES] Principles; Responsible Care, etc.).

From being an opponent, the private sector has gradually become a major partner in the development of a global governance of the environment. By promoting the idea of a partnership among the private sector, environmentalists, and the international community, the private sector has moved from laggard to “rule taker” to “rule maker” (Andrade and Puppim de Oliveira 2015). The CBD and states (such as Germany, Canada, and France) have adopted a strategy of engagement of the private sector, where business is seen as part of the solution.

Conclusions

As other authors have emphasized (e.g. Biermann 2014), the advent of the Anthropocene suggests the need to think anew about the nature of international environmental governance, a governance that takes advantage of the evolution of the system instead of fighting it; one that reflects the complexity of the issues and that acts as a counterpoint to existing models.

Although complexity theory has been applied to socioecological systems (Wells 2009), its potential for rethinking global governance has not been extensively probed. It deserves much more sustained attention. Rather than a methodology that could produce law-like statements, complexity is a method (Morin 1990), a roadmap of how one should think about phenomena, and pragmatism may very well constitute its philosophy. Moreover, it would be a welcome return to the notion that knowledge is contextual, in opposition to efforts by IOs and NGOs alike to come up with rules of governance that quickly morph into universal principles of public policy. This gives rise to a questionable doxa bound to disappoint for it may not be easily translated across time, space, and social systems.

Approaching the governance of the Anthropocene as a complex system allows us to incorporate much of current research in order to construct a coherent whole. Rather than being seen as the advent of chaos, paralysis, and effectiveness, the evolution of the global environmental governance system provides a set of tools for handling complex governance systems that take advantage of their properties and facilitate adaptation. However, seeing the governance of the Anthropocene as the product of a complex system does not mean that governance itself is always complex.

Simple policies can be adopted to deal with complex problems, and one issue is to investigate how best to govern the Anthropocene in terms of effectiveness (whose definition must include features of complex systems, such as adaptation and learning). It means adopting



a perspective from which new questions emerge. It leads to a redefinition of what is meant by science away from the modern tradition that thinks about the social and natural world and their interrelationships in dichotomous and linear terms, and "assumes the future is predictable [only a matter of knowledge] and that causes and effects are clearly related and measurable" (Boulton et al. 2015: 52).



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