

## 8 Regime Complexes

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The introduction of the concept of “regime complex” was a key theoretical innovation. It emerged from the pioneer work of scholars like Oran Young (1996) and Vinod Aggarwal (1998), who pointed out early on that some international institutions are embedded within broader institutional frameworks. These institutional frameworks have been called “clusters of regimes” (Stokke 1997; Rosendal 2001; Oberthür 2002), “conglomerate regimes” (Leebron 2002; Helfer 2004), “correlated regimes” (Sprinz 2000), and “networks of regimes” (Underdal and Young 2004). They are now widely referred to as “regime complexes,” a term coined by Kal Raustiala and David Victor in their seminal 2004 article (Raustiala and Victor 2004). Since then, Google Scholar reports more than 4,200 scientific publications on regime complexes and the concept has become a central element of the theoretical repertoire of global governance.

The broad appeal of the concept of regime complex arises from the recognition that international institutions are not created in a vacuum and do not develop in isolation from each other (Biermann *et al.* 2009a, 31). For example, a wide set of institutions govern climate change, including intergovernmental agreements, development banks, international scientific panels, transnational private regulations, agencies specialized on energy, free trade agreements, and international networks of cities (Keohane and Victor 2011; Abbott 2012; Young, chapter #, this volume). The concept of regime complex calls anyone who aspires to understand the creation, evolution, implementation or effectiveness of a particular institution to take into account its broader institutional environment. Indeed, the institutional density and overlaps characterizing regime complexes has been documented in diverse areas of global governance, including trade and investment, security, and human rights, among others. However, the concept of regime complexes “was first raised in the context of the global environment” (Raustiala 2012, 9) and researchers in global environmental politics “have so far produced the largest volume of writings on the subject” (Van de Graaf and De Ville 2013, 7).

At least four factors explain the concentration of the regime complex literature in the field of environmental governance. Firstly, the global environmental governance architecture is particularly fragmented due to the absence of a centralized world environment organization (Biermann *et al.* 2009b; Biermann, chapter #, this volume; Kim *et al.*, chapter #, this volume). Secondly, environmental institutions have proliferated in recent years to the point of creating an exceptionally high level of “institutional density” (Brown Weiss 1993; Young 1996; Raustiala and Victor 2004; Kim 2013; Mitchell *et al.*, chapter #, this volume). Thirdly, several scholars of environmental politics are particularly concerned with institutions’ effectiveness, drawing their attention to the “spillovers” and “externalities” resulting from other international institutions (Johnson and Urpelainen 2012; Kim 2004). Lastly, some of these scholars are keen to find an adaptive governance

system that could correct the “institutional mismatch” between stable political institutions and changing biophysical and socioeconomic systems (Galaz et al., 2008; Young 2010; Kim and Mackey 2014).

This chapter reviews this literature on environmental regime complexes. The first section clarifies the definition of regime complex and distinguishes it from similar concepts. The following three sections look respectively at the emergence, the development, and the consequences of regime complexes. The fifth section surveys the different methods used in the regime complex literature. Finally, the last section discusses future directions for research on environmental regime complexes.

## Conceptualization

Kal Raustiala and David Victor (2004, 279) define a regime complex as “an array of partially overlapping and nonhierarchical institutions governing a particular issue-area”. As such, a regime complex is located at a meso-level of organization. It goes beyond a discrete institution or even the mere linkage between two institutions (#, chapter #, this volume). A regime complex encompasses several distinct institutions (Orsini et al. 2013, 30). Yet, a regime complex is located at a lower level than the global governance architecture taken as a whole (Biermann and Kim, chapter 1, this volume; see also Biermann et al. 2009). The loosely coupled elements of a regime complex are related to the same issue area and often share some normative principles (Zelli et al. 2013). Thus, a regime complex can usefully be conceptualized as an open system, sufficiently held together to be recognizable but not completely detached from the rest of global governance.

As a system, a regime complex is made of units and connections. Mapping a regime complex, therefore, requires identifying these units and characterizing these connections. This task, however, often proves to be challenging, as the definition of both units and connections remain contentious.

First, regarding the units of regime complex, Raustiala and Victor (2004) argue that “elemental regimes” are explicit legal agreements. This legalistic understanding of elemental regimes facilitates the mapping of regime complexes but it leaves several analysts unsatisfied. It excludes institutions such as implicit norms, guidelines, clubs, private regulations, and transnational initiatives, which many analysts consider as important elements within a regime complex (Abbott 2012; Green 2013; Widerberg and Pattberg 2017; Green and Auld 2017).

An alternative is to rely on Krasner’s more classic definition of an international regime, as a set “of implicit and explicit principles, norms, rules, and decision-making procedures around which actor expectations converge in a given area of international relations” (Krasner 1982, 186). This definition, however, is also problematic in the context of a regime complex (Orsini *et al.* 2013). It creates ambiguity in the level of analysis as the elemental regimes constituting a regime complex can themselves be sets of various instruments. If an institution is made of institutions, which are themselves made of institutions, how one can know which of these is the regime complex? For example, should we consider the set of institutions governing endangered species as a regime complex, made of elemental regimes such as the whaling regime and the Atlantic tunas regime, or should we consider the set of institutions on endangered species as an elemental regime itself within the broader biodiversity complex? The most reasonable answer to this question is that the two positions can be valid, depending on the research question at hand. The

labels “regime” and “regime complex” are heuristic constructs that do not exist independently from the analyst. Their scale and scope are socially constructed. Thus, debates as to whether an institution on endangered species is essentially a regime or a regime complex are futile if unrelated to a specific research question. The label “regime complex” is appropriate at any level of analysis as long as institutions under study are analyzed as a set rather than as unconnected units or a cohesive block.

The second constitutive component of a regime complex is the connections linking the different constitutive elements. It is clear from the definition provided by Raustiala and Victor (2004) that these connections do not arise out of any form of legal hierarchy (Kim et al., chapter #, this volume). Instead, they emerge from partial overlaps over a given issue area. These overlaps can be at the normative or the impact level. In the regime complex for genetic resources, for example, it is one thing to argue whether the private property rights protected by the Agreement on Trade-Related Aspects of Intellectual Property Rights are consistent with indigenous communities’ rights over genetic resources as recognized in the Nagoya Protocol under the Convention on Biological Diversity, but it is another to ask whether the patent examination process impacts the effectiveness of the Nagoya Protocol. Overlaps can also be of conflicting or synergic nature. In the case of genetic resources, while some actors see conflict between the Nagoya Protocol and the Agreement on Trade-Related Aspects of Intellectual Property Rights, other stakeholders claim they are in a synergic relationship. In many cases, in fact, actors argue over the nature of the connections linking the various elements of a regime complex, making them particularly unstable.

Equally contentious are the consequences of partial membership overlaps. A regime complex can be made of plurilateral and transnational institutions, with public, private or hybrid membership (Green and Auld 2017). These overlapping memberships add a vertical dimension to a regime complex’s thematic horizontal dimension (Morin et al. 2017). Thus, a regime complex is composed neither of parallel regimes with a clear division of labor, nor of nested regimes embedded within each other like Russian dolls (Young 1996; Aggarwal 1998). A regime complex is messier than these neatly organized ideal types.

Moreover, the ambiguous and contested nature of overlaps between elemental regimes make regime complexes particularly dynamic. As actors try to address inconsistencies and reduce negative spillovers within a regime complex, they can alter existing regimes or create new ones. As a result of these actions, the institutional architecture of a regime complex at time  $t$  will most likely have a different shape than at time  $t+1$ . Accordingly, time is an important third dimension that must be included in the mapping of a regime complex (Anderson 2002).

This time dimension has drawn some analysts to use complex system theory to shed light on the evolution and expansion of regime complexes (Alter and Meunier 2009; Green 2013; Kim 2013; Kim and Mackey 2014; Meunier and Morin 2015; Morin, Pauwelyn and Hollway 2017). Karen Alter and Sophie Meunier (2009) coined the term “regime complexity” to express this marriage of regime complexes and complex system theory. However, the bulk of the literature on regime complexes is rooted in mainstream institutionalist thinking and the input from complex systems theory remains marginal. For most analysts, a regime complex refers neither to a theory nor to an attribute. It is merely a system of loosely coupled institutions.

Regime complexes can nevertheless be compared to each other for theory building and theory testing purposes. Daniel Drezner (2009) suggests comparing complexes according to their degree of vulnerability to regulatory capture. Thomas Gehring and Sebastian Oberthür (2009) point out that some regime complexes encompass competitive relations while other regime complexes are characterized by cooperative relations. These attributes, however, more appropriately describe elemental regimes (which vary in vulnerability to regulatory capture) or connections between two regimes (competitive or cooperative) rather than a regime complex as a whole. A useful variable truly attached to a regime complex rather than its constitutive elements and connections is its degree of integration. As Robert Keohane and David Victor (2011) argue, a regime complex is situated somewhere in between the two extremes of fully integrated regime and completely fragmented collection of institutions. Locating regimes complexes in this integration-fragmentation continuum emerges as a promising focus for further study (Morin and Orsini 2014; Biermann et al. 2009b; see also Biermann, chapter #, this volume). As the next sections discuss, the degree of integration can be approached either as a dependent variable, calling for explanations, or as an independent variable, pointing towards consequences for global governance.

## **Causes and Origins**

The creation of an intricate regime complex might appear as a counterintuitive anomaly. Conventional wisdom would expect states to use or modify an existing institution, rather than to pay the high transaction costs associated with the creation and management of overlapping institutions (Van de Graaf 2013, 15). Yet, regime complexes are increasingly frequent and many of them are even expanding over time. This observation, however, only appears counterintuitive if regime complexes are seen as the intentional consequence of states' concerted efforts. In reality, most regime complexes are the unintentional results of a succession of interactions.

Divergence of interests is one of the main reasons explaining the emergence and existence of overlapping institutions (Keohane and Victor 2011). When actors crucial to an issue area have strong but divergent preferences, they will unlikely converge around a single institution. They will more likely collaborate with like-minded countries to create institutions that are limited in scope and membership. This is especially the case for environmental problems that do not require a global concerted effort to extract gains from cooperation, such as the regulation of dangerous waste or genetically modified organisms. Powerful actors might then consider that the benefits of comprehensive and universal regime do not offset the concessions it requires from them (Rabitz 2016).

Even when an integrated regime is created, a regime complex can still emerge from it. As interests are not fixed but vary over time, some states might find themselves dissatisfied with the established regime. A coalition of dissatisfied states could then engage in regime shifting, which is the "attempt to alter the status quo ante by moving treaty negotiations, lawmaking initiatives, or standard setting activities from one international venue to another" (Helfer 2004, 14). By shifting the debates to another regime, the challengers create a feedback effect in the first regime. Alternatively, they can engage in "competitive regime creation" by creating *de novo* an institution that more closely represented their interests (Morse and Keohane 2014) and ideas (Oh and Matsuoka 2017). This is what Germany and other countries that were dissatisfied with the International

Energy Agency did by creating the International Renewable Energy Agency (Van de Graaf 2013; Urpelainen and Van de Graaf 2015).

In addition to “competitive regime creation,” regime complexes can also result from the creation of new linkages between existing regimes. Linkages can be created strategically to increase the gains from cooperation and create additional incentives for compliance (Leebron 2002). For example, the United States is able to extract more precise and more enforceable commitments on forestry and endangered species when these issues are negotiated in the context of a trade agreement (Jinnah 2011). Linkages can also result from the recognition that one regime impedes the effectiveness of another regime and efforts are deployed to reduce these unintended negative spillovers. When countries banned certain ozone-depleting substances and adopted substitutes that are potent greenhouse gases, the ozone regime was amended to better take into account norms from the climate regime (Johnson and Urpelainen 2012).

States are not the only creators of regime complexes. Important actors in the creation and expansion of regime complexes include private actors who establish institutions of their own (Abbott 2012; Green 2013; Green and Auld 2017) and advocate for new connections between existing institutions (Orsini 2013; Orsini 2016; Gómez-Mera 2017). They also include international organizations, which may create subsidiary organizations (Johnson 2014) and actively promote linkages among them (Jinnah 2011; Gómez-Mera 2016).

In fact, research has found that the creation of regime complexes often results from the coalescence of different factors and the interaction of various actors (Keohane and Victor 2011; Van de Graaf 2013). Far from creating pressures for a more centralized and integrated institutional architecture, the proliferation of actors and institutions in global governance seems to lay a fertile ground for even more regime complexes. In this sense, systems of institutions have the property of autopoiesis, as they can generate more of themselves (Morin, Pauwelyn and Hollway 2017).

## **Evolution**

Raustiala and Victor (2004) suggest that regime complexes evolve in ways that are distinct from decomposable single regimes. While the development of standard regimes is driven by political contestation over core rules, the evolution of regime complexes is mediated by a process focused on the inconsistencies at the “joints” between elemental regimes. In addition, extant arrangements in the various elemental regimes will constrain the process of creating new rules within these elemental regimes. As a result, the regime complex as a whole will evolve in a path-dependent manner. In other words, the evolution of rules within a regime complex will not correspond neatly to changes in the underlying structure of power, interests, and ideas.

Building on this, several scholars have set out to examine the drivers and trajectories of regime complex development (Morrison 2017). Regarding the timing and nature of change, Colgan and colleagues (2012) argue that the energy regime complex has evolved according to a pattern of punctuated equilibrium, characterized by both periods of stasis and periods of great innovation, as opposed to a continuous, gradual process of change. Dissatisfaction on the part of powerful actors with the outcomes in the regime complex largely account for this specific pattern.

A more linear model is the “co-adjustment model” developed by Morin and Orsini (2013). They contend that complexes have a life cycle that consists of four stages. The first stage, *atomization*, actually precedes the regime complex as the elemental regimes still exist independently from each other. In a second stage, *competition*, the various elemental regimes morph into a wider complex and compete for strategic positions within it. Some regime complexes reach a third stage of *specialization*, whereby elemental regimes coexist in relative harmony and explicitly recognize each other’s competence. A fourth stage may eventually emerge, *integration*, when the regime complex becomes unified and reaches internal stability. The quest for greater policy coherence at the domestic level is a major incentive for more integration at the level of the regime complex, although this does not mean that every complex will necessarily reach the fourth stage.

Some scholars go a step further and argue that there is a natural tendency in regime complexes to move toward greater synergies and even integration. Normative conflicts and regulatory competition between elemental institutions are frequently assumed to “drive the institutions towards an accommodation even in the absence of a coordinating institution” (Oberthür and Gehring 2006, p. 26). Inspired by ideas from institutional ecology, Gehring and Faude (2013) contend that regime complexes evolve in the same way as populations of organizations. Functional overlap between elemental institutions creates competition between institutions over regulatory authority and scarce resources. Over time, they expect selection processes to eventually lead to an internal division of labor in regime complexes, characterized by institutional specialization into specific niches and reduced functional overlap.

Whether regime complexes stay fragmented or develop a division of labor depends partly on the characteristics of the issue area at hand. For example, due to the strong interest diversity of major powers in the realm of energy, Colgan et al. (2012) do not expect a coherent energy regime to emerge anytime soon. Likewise, in their study of the climate regime complex, Keohane and Victor (2011) expect fragmentation to persist since it is the product of rather stable traits of the issue at hand: strong interest divergence, high uncertainty, and the absence of productive linkages between all the cooperation problems in climate change. A factor that is likely to foster regime integration might be “negative spill-overs” between international regimes (Johnson and Urpelainen 2012).

Most scholars, however, do not assume that regime complexes evolve naturally, as a result of generic forces of competition or the traits of a particular issue. Instead, the evolution of regime complexes is shaped by the interests and power of the actors who create and operate these regimes (Orsini et al. 2013). States and non-state actors can employ a host of “cross-institutional strategies” when faced with a fragmented governance architecture. In forum shopping, the shopper strategically selects the venue to gain a favorable decision for a specific problem (Busch 2007). Actors may also deliberately create strategic inconsistency or strategic ambiguity between parallel venues (Raustiala and Victor 2004; Alter and Meunier 2009).

Yet, not all strategies of state actors result in creating overlap and potential inconsistencies between parallel venues. Aggarwal (1998) distinguished several strategies aimed at “institutional reconciliation,” including nesting broader and/or narrower regimes in a hierarchical fashion, establishing a division of labor between parallel regimes, or modifying existing organizations with a view to securing institutional compatibility with other regimes. States and non-state actors might also attempt to link and integrate different forums, by proposing a common normative frame applicable to all forums, a strategy

named “forum linking” (Orsini 2013). Finally, Rabitz (2016) argues that, under certain conditions, actors’ cross-institutional strategies are constrained and change in a regime complex takes the form of “institutional layering.”

## **Consequences and Effects**

There is little doubt that regime complexes have consequences for global governance and international cooperation. A higher institutional density in a given issue area is hypothesized to lead to a greater role for implementation in determining outcomes, a greater reliance on bounded rationality in actor decision making, more social interaction among key actors, more forum shopping, more institutional competition, and more feedback among institutions (Alter and Meunier 2009). Whether these are good outcomes, in normative terms, continues to be hotly debated, particularly among lawyers (Raustiala 2012; Papa 2015).

On the one hand, regime overlaps could have negative effects, such as introducing confusion over authority, unclear organizational boundaries, and rule uncertainty. This may lead, in turn, to reduced accountability and lower levels of compliance with international commitments (Raustiala 2012). Regime complexes could also lead to duplication of efforts (Orsini 2016), confused vision (Gallemore 2017), turf wars between bureaucracies (#, chapter #, this volume), and inefficiencies (Alter and Meunier 2009; Biermann et al. 2009b; Kelley 2009). The proliferation of international treaties may result in “treaty congestion” (Brown Weiss 1993; Hicks 1999; Anton 2012), a term that alludes to conflicts in objectives, obligations, or procedures. Finally, the presence of multiple, overlapping institutions can also strengthen powerful actors, who may be able to navigate complex settings while placing a heavy burden on weaker actors, thus exacerbating existing power imbalances (Benvenisti and Downs 2007; Drezner 2009; Orsini 2016). On the other hand, regime complexes also bring benefits and opportunities for cooperation that would not occur if a single regime enjoyed a monopoly of governance in a given area. The redundant overlap in competences between different institutions makes it less likely that blame avoidance will result in issues being overlooked (Kellow 2012). Regime complexes are also thought to have greater flexibility (across issues) and adaptability (across time) over single, legally-integrated regimes (Keohane and Victor 2011; Kellow 2012; Stokke 2013). In that sense, institutional diversity and competition should not be seen as a design failure, but regime separation can be willfully pursued as a design strategy by international negotiators (Johnson and Urpelainen 2012).

Insights from organizational ecology theory (Abbott et al. 2016; Gehring and Faude 2014) and complex system theory (Kim and Mackey 2014) further suggest that institutional competition may foster beneficial adaptation. Competing institutions are under pressure to specialize in a specific niche. This can be done thematically, but niche selection could also take place with regard to governance tasks, such as generating knowledge, strengthening norms, enhancing problem-solving capacity, or enforcing rule compliance (Stokke 2013). Through competition and niche selection, the population of institutions continually adapts to exogenous shifts and those institutions best suited to their environment thrive.

In theory, polycentric instead of monocentric governance systems also provide more opportunities for experimentation to improve policies over time (Alter and Meunier 2009; Hoffmann 2011; De Burca et al. 2014). They also open up possibilities for “inter-

institutional learning” (Oberthür 2009; Young 2010), and increase communications and interaction across parties to international institutions, thus helping to foment the mutual trust needed for international cooperation (Ostrom 2010; Cole 2015). Finally, several features of regime complexity—inter-institutional competition, decentralized authority, and opportunities for forum shopping—can provide conditions for global democratization (Kuyper 2014 and 2015).

Given these mixed effects on outcomes in global governance, several analysts consider that regime complexes and interactions should be actively managed (Keohane and Victor 2011; Young 2012; Abbott 2014; Morin et al. 2017; #, chapter #, this volume). One way to achieve greater coherence and coordination is by centralizing authority, for instance in the form of a world environment organization, an idea that is as fiercely advocated by some as it is opposed by others (for example, Whalley and Zissimos 2001; Najam 2003; Oberthür and Gehring 2004; Biermann 2005 and 2014). Of course, centralization means that it is no longer possible to talk about a regime complex, since the non-hierarchical relation between regimes is a defining feature of a regime complex (Raustiala and Victor 2004; Kim et al., chapter #, this volume).

Since centralization might undo some of the purported benefits of having multiple institutions, other scholars have proposed alternative coordination mechanisms. *Interplay 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; #, chapter #, this volume). *Orchestration* involves efforts by state actors and intergovernmental organizations to mobilize and work with private actors and institutions to achieve regulatory goals (Abbott and Snidal 2010; Abbott 2012; #, chapter #, this volume). Under the right conditions, such acts of orchestration can improve transparency and accountability (Bäckstrand and Kuyper 2017). International organizations can also rely on *institutional deference*, recognizing and ceding regulatory authority and jurisdiction to other organizations. These attempts at inter-institutional coordination tend to be based on a division of labor among organizations, ultimately aimed at reducing overlaps and conflicts within regime complexes (Pratt 2016).

In some cases, collaboration between international regimes is achieved through legal means, for example, through “saving clauses” (Raustiala 2012), “cooperative agreements” (Scott 2011) or “clustering” international agreements (von Moltke 2001; Oberthür 2002). In other cases, interaction management boils down to knowledge management, which can be achieved by bringing together stakeholders from different regimes in so-called “boundary organizations” to facilitate information sharing, joint knowledge production and the improvement of institutional interactions (Morin et al. 2016).

Regime complexity does not only have consequences at the systemic level—say, the governance architecture—but also at other levels. Institutional proliferation can lead to a restructuring of the mandates of international organizations, for instance. Incumbent organizations faced with new entrants can become “challenged organizations” and face pressure to adapt formally (Betts 2013) or informally (Colgan and Van de Graaf 2015) to remain the focal point in their area of operation.

Other studies focus on the influence of regime complexity on actors’ strategies. Institutional overlaps provide state and non-state actors with opportunities for “forum shopping” and “regime shifting,” as noted above. In general, this increases the menu of institutional options when actors are confronted with a problem that calls for international



coordination or collaboration: states and other actors can decide to use an existing organization, modify one so that it is fit for purpose, select between different institutional venues, or create an entirely new organization (Jupille et al. 2013). The latter option—institutional creation—could further increase the fragmentation and density of governance (Morse and Keohane 2014; Urpelainen and Van de Graaf 2015).

These kinds of cross-regime strategies could in turn contribute to the effectiveness and success of cooperation in regime complexes (Ward 2006). To the extent that these strategies are cooperative rather than opportunistic, state and non-state actors can take advantage of institutional overlaps to exchange information, create and reframe issues, diffuse norms, and even develop complementary legal instruments. Cross-regime strategies may in turn offset the negative spillovers of overlapping institutions (Gómez-Mera 2016).

## **Research Methodologies**

Over the last fifteen years, empirical studies on regime complexes have grown significantly, not only in quantity but also in their methodological scope and sophistication. The early work, which was primarily conceptual in its focus, used qualitative and historical cases of different regimes to illustrate different taxonomies and typologies of institutional linkages and interactions. As noted above, environmental regimes have occupied a central place in this literature. Young (1996, 2002, 2008, etc.) used examples from environmental governance to illustrate the distinction between embedded, nested, overlapping and clustering regimes, as well as the emergence of horizontal and vertical institutional interplay. Important conceptual contributions by Stokke (2001), Rosendal (2001), Raustiala and Victor (2004), and Oberthür and Gehring (2006) also focused empirically on different issue areas in global environmental governance.

Building on these insights, numerous cases of regime complexes have been documented in diverse fields of global governance, among others on maritime piracy (Struett et al. 2013), international security (Hofmann 2009), human trafficking (Gómez-Mera 2016 and 2017), refugees (Betts 2013), energy (Colgan et al. 2012), food security (Margulis 2013), human rights (Hafner-Burton 2009), public health (Holzscheiter et al. 2016), shipping (Stokke 2013), trade (Gómez-Mera 2015), and intellectual property (Muzaka 2011), to cite but a few. The environment—including fisheries, climate change, and biodiversity—has continued to occupy pride of place in the regime complex literature (for example, Gomar *et al.* 2014; Michonski and Levi 2010; Paavola *et al.* 2009; Zelli and Pattberg 2016; Young 2017). To this rich body of empirical work by political scientists, international legal scholars have added their own comprehensive studies of fragmentation and conflictive overlaps in various areas of international law (for example, Pauwelyn and Alschner 2014; Davey 2006; Kwak and Marceau 2008).

Many of these studies provide detailed maps of regime complexes and identify the main actors and institutions involved in each issue area. While illuminating, most of these studies focus only on single cases of regime complexes or dyads of overlapping regimes, with limited scope for generalizations of insights beyond the specific cases (Koops and Biermann 2017). Moreover, much of this work has relied too heavily on desk research and would benefit greatly from more active field work, including interviews with key players within international governmental and non-governmental organizations, and even participant observation (Koops and Biermann 2017). Such in-depth qualitative

research is crucial to assess empirically the causal effects of regime overlaps and interactions through, for example, counterfactual analysis (Alter and Meunier 2009).

In an attempt to overcome some of these methodological problems and, in particular, constraints to generalizability, scholars have begun engaging in collaborative projects aimed at the systematic collection of data on larger numbers of cases. The collection of original large-*n* data has allowed for a quantitative turn in the study of overlapping institutions and regime complexes, particularly in the areas of environmental and trade governance. The International Environmental Agreements Database Project, for example, includes 1,287 multilateral agreements, 2,170 bilateral agreements, as well as almost 250 other environmental agreements, as well as specific information on when agreements were signed, ratified, and entered into force (<https://iea.uoregon.edu>; Mitchell et al., chapter #, this volume). In addition, scholars have made significant progress in the collection of data on transnational private initiatives, through the Climate Initiative Platform and the Non-State Actor Zone for Climate Action, both of which focus on arrangements driven by non-state actors.<sup>1</sup> Apart from detailed descriptions and mapping of governance structures in each of these areas, this data has been used to test hypotheses on the determinants of fragmentation and cooperation within regime complexes, using other methods, including regression and social network analysis (Widerberg and Pattberg 2017).

Indeed, studies that apply social network analysis (SNA) to global environmental governance have proliferated in recent years (for example, Ward 2006; Kim 2013; Hollway and Koskinen 2015; Morin et al. 2016; Böhmelt and Spilker 2016; Green 2013). Social network analysis permits analyzing the multiple interconnections among the various legal instruments, organizations, and public and private actors in regime complexes. It is useful for studying degrees of centrality, clustering, and positioning of elements and actors within the complex. Moreover, the various community detection methods used in SNA are especially relevant for the study of regime complexes, since they may help identify their (emergent and dynamic) not just their different components but also their boundaries. Along these lines, Kim (2013), for example, argues that a network-based approach is necessary to obtain a macroscopic view of international environmental law, which captures the basic patterns of connections among its components. Using a dataset of 1001 cross-references among 747 multilateral environmental agreements, his study documents the increasing fragmentation in global environmental governance. Morin et al. (2016), in turn, use social network analysis to study the density of relations among individuals working at the Intergovernmental Science-Policy Platform on Biodiversity and Ecosystem Services so as to assess the latter's "social representativeness" and its ability to contribute to the governance of the biodiversity regime complex.<sup>2</sup>

Despite the growing focus on network dynamics and effects, some scholars have continued to focus on the ways in which regime complexity and overlapping institutions influence the incentives and choices of actors, particularly states and intergovernmental organizations. A number of studies have relied on formal models to generate clear and testable propositions on states' selection among competing fora (Busch 2007) and their decisions to create new overlapping institutions (Urpelainen and Van de Graaf 2016).

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<sup>1</sup> See <http://climateinitiativesplatform.org/> and <http://climateaction.unfccc.int/>. See Widerberg and Stripple (2016) for an overview of another five databases on cooperative initiatives for decarbonization.

<sup>2</sup> Network analysis has also been increasingly used to study the trade regime (for example, Pauwelyn and Alschner 2014; Milewicz et al. 2014; Morin, Pauwelyn, and Hollway 2017).

Others, use standard econometric techniques to examine how states respond to cross-regime influences (Gómez-Mera and Molinari 2014).

## **Conclusions and Future Directions**

Since the Scientific Plan of the Earth System Governance Project called for greater examination of regime complexes in 2009 (Biermann *et al.* 2009a), research has made remarkable theoretical and methodological progress, providing illuminating insights into the sources, evolution, and effects of institutional density and overlaps in world politics. Where does this scholarship turn next? We suggest a number of avenues for future research, which might contribute to a deeper and theoretically informed understanding of regime complexity and its implications for global governance.

First, for all the progress made in the identification of causal pathways and mechanisms through which regime complexity matters, we still lack a coherent and comprehensive theory of regime complexes and their implications. While facilitating comparison across cases, the proliferation of taxonomies of regime overlaps and institutional linkages has also introduced some “terminological confusion and stands in the way of a more coherent program” (Zelli *et al.* 2009, 4). Lack of consensus in the literature over the definition of key concepts, such as “regime complex,” “overlaps,” and “conflict,” hinders the development of general hypotheses that could be tested across cases. Moreover, while recent research on networks is fascinating, more could be done to clarify the theoretical contribution of this work to general debates in International Relations research. As Alter and Meunier (2009) suggest, it is crucial that social network analysis be driven by theoretical questions concerning the causal links between regime complexity and networked relationships. In this sense, future research on regime complexes would benefit from greater theoretical discipline, perhaps by drawing upon existing theories in International Relations and Comparative Politics. In this way, research on regime complexity would also contribute to more central questions and debates in these fields.

A second line of promising research has begun incorporating analytical tools and metaphors from evolutionary biology to the study of regime complexes. International relations theorists have for a number of years incorporated these ecological metaphors to their writings (Jervis 1998; Rosenau 2003; Axelrod 2006). They have only recently started to blossom in the study of international institutions and regime complexes. Indeed, insights from evolutionary biology are particularly helpful to make sense of change and evolutionary dynamics in regime complexes, an issue that has the extant literature has largely overlooked.

Along these lines, scholars have approached regime complexes as “complex adaptive systems,” in which “large networks of components with no central control and simple rules of operation give rise to complex collective behavior, sophisticated information processing and adaptation through learning or evolution” (Mitchell 2009, 13). In these complex systems, moreover, interactions among constituent parts give rise to adaptation through learning or to co-evolution (Kim and Mackey 2014; Pauwelyn 2014). Alter and Meunier (2009, 15) were among the first to link regime complexes to complexity theory, recognizing the particular usefulness of the idea that “understanding units does not sum up to the whole and that dynamics of the whole shape the behavior of units and sub-parts.”

Organizational ecology is also illuminating in understanding the proliferation and density of specific types or groups of organizations and how their evolution is shaped by their environment (Gehring and Faude 2014; Abbott et al. 2016). An organizational ecology perspective places emphasis on the competition for resources among overlapping organizations, and the process of natural selection determining success or failure of different organizational forms, and more generally, the decline and survival among populations. Similarly, the idea of punctuated equilibrium, can also be used to describe patterns of change and evolution in regime complexes and in international law more generally (Diehl and Ku 2010; Colgan et al. 2014; Goertz 2003). While international legal change is often incremental, modern international law has been characterized by sudden and dramatic breaks, in which a new treaty or instrument is introduced, followed by long periods of stability (or stasis).

Insights from evolutionary biology have been growing in the study of international institutions. Yet, they are still used sparsely, often unreflexively, and almost exclusively in the field of global environmental governance. There is much to be gained from a more systematic and theoretically informed application of these concepts to the study of the evolution of regime complexes. This could be easily done given the aforementioned progress in data availability and methodological tools in the field.

Finally, despite a broadening of the empirical focus in recent years, the regime complex literature remains strongly concentrated in environmental governance. Yet our understanding of the latter would only benefit from direct and indirect comparisons with other issue areas. Greater collaboration with scholars beyond the Earth System Governance Project, focusing on different issue areas, including trade, security, and human rights, would also add to the theoretical coherence of the regime complex literature.

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