

Part IV

Future Directions

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Taking Stock and Moving Forward

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Given the scope of the research programme that we present here, it is hardly possible to draw one overarching conclusion. There is no one-liner, no elevator pitch, no single finding when it comes to the complexities of the broader architectures of earth system governance. A few overriding conclusions, however, stand out, and we present them in the next section of this chapter. Following that, we identify four promising new research trends. Finally, we sketch a set of transformative policy proposals regarding the architecture of earth system governance.

Crosscutting Contributions

Four crosscutting contributions are supported by all chapters in this book, though to varying degrees.

First, this book brings much-needed conceptual clarity to a profuse but meandering debate. Concepts such as ‘interplay’, ‘complexes’, ‘integration’, ‘interlinkages’ and ‘fragmentation’ pervade the burgeoning literature in this field, with little agreement, so far, on how specific terms relate to others. With the collective insights of 42 experts collaborating in the 14 chapters in this book, we can better define, compare and relate the various conceptualizations in which the architecture debate is awash. While we cannot claim that our book resolves all conceptual contestation, the organization of the volume, the depth of the individual chapters and the collective effort of all our contributors will clearly help strengthen conceptual clarity in this field. The glossary presented at the end of the volume further advances this aim.

Second, this book shows that architectures matter. Whereas individual institutions and distinct regimes were at the core of the debate from the 1970s through to the 1990s, when pioneering scholars such as Oran Young, Arild Underdal, Ronald Mitchell, Steinar Andresen, Sebastian Oberthür and others advanced our

understanding of environmental ‘regime effectiveness’, the new wave of research since the 2000s has shown that institutions do not operate in a void. Instead, they are enmeshed in complex structures of which they are merely a part. All contributions to this volume emphasize the importance of such structures, which we conceptualize as the architectures of earth system governance. The book provides substantial evidence that it matters at the micro level how institutions interact with others; that it matters at the meso level how institutions are entangled with others in larger regime complexes; and that it matters at the macro level how institutions are affected by broader architectures that are more or less fragmented or polycentric.

Third, the book offers numerous insights on the policy interventions that can address problems of conflictive interlinkages, complexity and fragmentation. Given the increasing structural complexity of the architecture of earth system governance, it is not surprising that highly diverse policy responses are available, and in fact used, to deal with these challenges. These responses range from inter-play management to policy integration, orchestration, global goal-setting and, as the most radical intervention, the hierarchization of norms, institutions and priorities. Traditionally, most responses were targeted at the level of dyads, that is, interactions between merely two institutions or organizations. More recently, however, the range of responses has expanded to incorporate attempts at overall coordination and structural reform of the entire architecture of earth system governance. Even so, the ‘old’ modes have received renewed attention in recent years as well.

Fourth, the book is firmly located beyond the statist perspective of the 1980s and 1990s, which was informed – at least in the North American and European international relations discourse – by the meta-debates between neoliberal institutionalism and neorealism. Most chapters in this book go well beyond this statist perspective and include in their analysis the increasing role of non-state actors in earth system governance as norm-creators, global orchestrators, builders of transnational institutions and so on. The conceptual turn during the late 1990s from intergovernmental relations to governance is fully reflected throughout this volume. Undoubtedly, the governance architectures that we are discussing comprise both public and private actors. They include states as well as actors that seek to represent civil society, science organizations and major corporations and their global associations and networks. This does not imply, however, that the role of governments is necessarily shrinking. While non-state actors assume novel roles and add to the complexity of global steering processes, governments – and in particular the governments of the larger countries – remain powerful actors within the complexities of novel governance architectures.

New Research Trends

In addition to these crosscutting themes and findings, numerous new lines of research have become central over the last decade, many of them flowing from the work presented in this book. We identify three promising trends and research directions as most relevant and interesting.

Complexity and Polycentricity

To start with, many scholars have turned in recent years to studying large sets of international institutions under new headings, especially complexity and polycentricity.

Research on complexity has two dimensions: the governance of complexity and the complexity of governance. In the former use of the term, research is not about analyzing institutional complexity as such, but about finding ways to govern complex systems (Duit and Galaz 2008; Underdal 2010; Le Prestre 2017; Young 2017). Much of this research is motivated by systems or complexity thinking. In particular, researchers have applied the Conant-Ashby theorem (Ruhl 2008; Duit et al. 2010; Kim and Mackey 2014), which suggests that for governance to be effective, the complexity of governance needs to match the complexity of the system being governed (Conant and Ashby 1970).

In the latter use of the term, complexity refers as a variable to a *quality* of a governance architecture. In this sense, a governance architecture can be more or less complex, and hence potentially more or less effective, fair, adaptive or whatever performance criterion one wants to use. In this meaning, complexity has been central in several recent studies. Conceptually, however, this use of ‘complexity’ has not added much to the more widely used term ‘fragmentation’. Architectures of global governance can be described as more or less fragmented, or more or less complex, with little analytical difference. One more practical consequence lies in the possibility of interdisciplinary exchange and cooperation. The notion of a fragmented governance system, for one, is more widely used in the legal literature and in the policy world; here, analysts can link their studies more easily to United Nations processes or legal reform debates. Also, fragmentation is easily conceptualized as a process, which allows for comparative research over time, examining processes of governance fragmentation and defragmentation. The notion of complexity, in contrast, opens avenues for collaboration and mutual inspiration with the field of complexity studies, as well as with those science disciplines that are deeply involved with the study of complexity, such as theoretical physics, biology, ecology, system analysis and information sciences. This link or bridge to the natural sciences allows for the employment of sophisticated tools and methods, such as the modelling of networks and agent-based modelling. Like ecological systems, for

example, scholars might be able to claim that complexity within governance architectures emerges through self-organization of their elementary units, similar to the evolution of ecosystems.

Broadly speaking, governance scholars have operationalized institutional complexity with two variables: diversity and multiplicity. The logic is that a system with more diverse or a greater number of institutions is likely to be more complex. For example, Zelli, Möller and van Asselt (2017: 670) understand institutional complexity as ‘a diversity of international institutions that legally or functionally overlap in addressing a given issue area of global governance’. This simultaneous use of ‘complexity’ and ‘diversity’ might invite criticisms of tautological reasoning unless compelling conceptual differences between complexity and diversity can be shown. Van Asselt and Zelli (2014) consider the number of institutions as a useful measure of institutional complexity; in future research this might need to be strengthened by additional information on their interlinkages and relative weight and power.

In general, analysts in this line of studies observe an increasing level of institutional complexity at the global level, and attribute it to ‘the rise of private and hybrid authority manifested by collaborative governance arrangements’ (Widerberg 2016: 84), in addition to more traditional international public institutions (also Green 2013; Green and Auld 2016; Hickmann 2017; Zelli, Möller and van Asselt 2017). These scholars argue that the emergence of private authorities and their private certification schemes does not bring together disconnected institutions but rather creates an extra layer of complexity (Gulbrandsen 2009; Kalfagianni and Pattberg 2013; van der Ven, Rothacker and Cashore 2018). As noted above, a similar observation could be expressed in terms of increased fragmentation of a global governance architecture.

This suggests again that both terms are largely synonymous descriptions of qualities of governance architectures, yet both bring different opportunities for cross-disciplinary exchange and cooperation. It is conceivable, of course, that the two concepts are today synonymous largely because the complexity research programme has not advanced very far yet, inasmuch as it still views complexity in the same terms as described by fragmentation. If the complexity research programme could move to actually analyzing governance systems as complex systems, the two approaches might become more different over time.

The second conception of complexity just discussed is also similar to polycentricity. Polycentricity too describes a structural quality of an architecture and is hence in line with the notion of fragmentation (Chapter 8). Polycentricity owes much to the work of Elinor Ostrom and as such often has a positive normative connotation (Aligica and Tarko 2011). For many scholars, polycentricity is not only

seen as a *description* of a governance architecture but also as a *virtue*. Polycentric governance systems are under certain circumstances assumed to be, following Ostrom's work, more effective than centralized monocentric ones. Recently, the notion of polycentricity has been systematically employed to study global climate governance, and here with a more nuanced normative assessment than this concept normally carries (Jordan et al. 2015; Jordan et al. 2018).

Regarding the notion of regime complexes, however, we see a clear difference between this term, on the one hand, and institutional complexity on the other, despite linguistic similarity. Complexity is a variable quality of an architecture of institutions, and as such is comparable to both fragmentation and polycentricity. A regime complex, instead, describes a unit at the meso level of governance (Orsini, Morin and Young 2013), that is, an assemblage of international regimes, other institutions and actors, which can all be described as one 'complex' (see in more detail Chapter 7). Like governance architectures at the macro level, also regime complexes at the meso level can be described by qualities such as their levels of fragmentation or polycentricity.

Recent research has sought to identify and explain the effects of institutional complexity and polycentricity on, for example, the performance of agents operating within given policy domains. But the perception that researchers bring to the analysis often predefines the approach taken as well as its conclusions. On the one hand, complexity is often used interchangeably with disorder, chaos and uncertainty; something that needs to be reduced or managed. Moreover, the term is associated with multiplicity, which implies for some an increased probability of 'inconsistent international legal commitments' (Axelrod 2014: 987). Legal indeterminacy, normative ambiguity and regulatory uncertainty, institutional complexity or fragmentation, are all supposed to make international cooperation more difficult, for example, in attempting to meet the environmental, economic and legal challenges of transnational environmental crime (Elliott 2017). In short, like fragmentation, complexity is often associated with negative effects (e.g., Drezner 2009).

On the other hand, complexity is also studied with a more optimistic approach – again, not different from the literature on governance fragmentation. For example, complexity is seen as a necessary ingredient for adaptability, flexibility and resilience of a governance architecture. Studies have identified some degree of order or (organized) complexity in the structure of systems of international institutions that were previously imagined to be chaotic. For example, a distinct order has emerged out of the seemingly chaotic and complex institutional landscape of global carbon standards (Green 2013). In a similar vein, Hickmann (2017) argues that the spread of sub- and non-state climate initiatives does not lead to a loss of state authority, but rather enhances the centrality of state-based forms of governance, because

transnational actors often use the climate regime as a point of reference and build upon the norms and rules stipulated in international agreements.

These findings have important implications for policy responses to institutional complexity. Scholars have suggested various policy strategies that are more or less explicitly captured in concepts such as harnessing (Axelrod and Cohen 1999; Ruhl, Katz and Bommarito 2017), taming (Barabási 2005), embracing (Hirsch et al. 2011) or managing institutional complexity (Oberthür and Stokke 2011; Lubell 2013; Pickering, Betzold and Skovgaard 2017). Despite subtle differences and slightly varying connotations, what is common to these concepts is the view that ‘the complexity of an interconnected society and its governance require a complexity-informed approach’ (Teisman and Gerrits 2014: 17). In other words, we need to delve deeper into the study of institutional complexity in order to provide evidence-based policy advice to navigate our societies through mounting global challenges and promote the transformation of governance structures.

Evolutionary Dynamics

Despite the connotation of immovability that the concept of architecture carries, such macro-level structures are not static. Architectures of global governance are fluid and dynamic, continuously changing in response to pressures and governance processes. Scholars have so far devoted only limited analytical attention to these dynamics due to the prevailing focus on elementary institutions and their interactions. Over the past decade, however, a new research focus has emerged, seeking to unravel how governance architectures evolve over time. This research strand describes and analyzes architectural change through innovative empirical and methodological approaches. It also suggests possible explanations for observed changes from diverse theoretical perspectives.

A *longitudinal perspective* on governance architectures has proven useful for a fuller understanding of actor configurations, as well as the processes that produce distinct structural patterns. Integration (Chapter 9), orchestration (Chapter 11), fragmentation (Chapter 8) and hierarchization (Chapter 13) are all processes that can reshape an architecture. But these processes cannot be properly understood through snapshots representing particular moments in time. A longitudinal analysis is thus necessary to identify changes, for example in the degree of fragmentation over time (Kim 2013; Greenhill and Lupu 2017). One could also develop a metric to measure the degree of fragmentation, but it will be difficult to interpret the result without placing that number into a comparative perspective as well.

Over the past decade, analysts have made a number of efforts to theorize the evolutionary dynamics of governance architectures. We introduce three research strands here, by no means an exhaustive list. First, scholars have used the

concept of *punctuated equilibrium* to study dynamics in global energy governance (Colgan, Keohane and Van de Graaf 2012). This strand has produced insights into when and under what conditions innovations occur that generate abrupt structural changes, and is particularly well suited to explaining transformative change in governance architectures (Kettl 2015). Second, an interesting theoretical development is the application of *organizational ecology*. Here, scholars have tried to understand institutional change in global governance by focusing on ‘populations’ of institutions as the unit of analysis. This has enabled analysis of the influence of institutional environments, especially their organizational density and resource availability, on organizational behaviour and viability (Abbott, Green and Keohane 2016). Organizational ecology has been useful in explaining, for example, why international organizations fail to spread more evenly within a governance architecture when they expand and proliferate (Morin 2018). A third theoretical lens on the evolution of governance architectures is the concept of *complex adaptive systems*. Here, scholars emphasize endogenous processes of selection akin to natural selection as a key explanatory variable and apply this empirically to environmental as well as non-environmental institutional systems (Kim and Mackey 2014; Pauwelyn 2014; Morin, Pauwelyn and Hollway 2017).

These three theoretical approaches are derived from the natural sciences and were originally designed to explain how ecosystems evolve. The models thus tend to overlook the role of human agency in shaping global governance. It is assumed that individual agents are homogeneous and react to structural constraints in a similar and predictable manner. But social systems are different. Architects are heterogeneous. They possess varying levels of power, authority and legitimacy, seek to further particular interests and exercise agency (Schroeder 2010; Dellas, Pattberg and Betsill 2011; Bouteligier 2011; Newell, Pattberg and Schroeder 2012; Mukhtarov and Gerlak 2013). And while architects have the capacity to shape the governance architectures within which they operate, existing frameworks and dominant norms simultaneously shape their roles and capacities (Dellas, Pattberg and Betsill 2011). Therefore, the precise mechanisms by which architectures evolve, through the myriad decisions of relatively autonomous architects, remain obscure and require further study (e.g., Hollway 2015, Rabitz 2017).

Furthermore, given the density of the architectures of earth system governance and their long history and evolution, more research is needed on the factors that can explain not only the creation of international institutions, but also their ‘deaths’, and the associated impacts on the global governance architecture. While new international institutions are regularly created, a considerable number of institutions become inactive or dormant. In some instances they even cease to exist or ‘die away’ (Jinnah 2011; Eilstrup-Sangiovanni 2018). As more and more

international institutions complete their life cycles, we expect to observe a considerable change in the structure and dynamics of earth system governance.

In sum, a richer understanding of the evolutionary dynamics of governance architectures requires an integrative framework that brings together three bodies of literature: ideally, it should combine insights from theories of institutional change (e.g., Hall 2010; Young 2010a, 2010b; Marcoux 2011; Hall 2015, 2016); work on institutional interactions and inter-organizational relations (e.g., Young 2002; Gehring and Oberthür 2009; R. Biermann 2008; R. Biermann and Koops 2017); and theories of macro-level structural change (e.g., Kim 2013; Morin, Pauwelyn and Hollway 2017).

Transformative Reform

Along with analyzing adaptive or evolutionary change, earth system governance researchers are also investigating how to *deliberately* transform governance architectures that are no longer fit-for-purpose in addressing problems of earth system transformation (O'Brien 2012). This research builds on previous work on how to better design (Young 2011) or adapt (Boyd and Folke 2012; Ruhl 2012; Tomozeiu and Joss 2014) individual international regimes and institutions. The same key concepts apply, such as fit, interplay and scale (Young 2002), but these concepts are applied at much larger scales. For example, one might ask whether the entire architecture of global biodiversity governance is doing more harm than good. If so, and if this is found to result from excessive fragmentation, one would then ask how to remedy it (Jóhannsdóttir, Cresswell and Bridgewater 2010). Essentially, this research programme aims to transform the structure of global governance architectures so as to make them more impactful.

This research programme is not entirely new; it dates back at least to the 1990s, with debates about the need for a world environment organization (e.g., Biermann and Bauer 2005). Another early example is the proposal for a law of the atmosphere, which would have had profound implications for the governance of climate change, stratospheric ozone depletion and air pollution. These debates resurface from time to time in different forms. For example, the idea of a more centralized steering mechanism in earth system governance found support in proposals for a United Nations Sustainable Development Council (Kanie et al. 2012; Biermann et al. 2012; Biermann 2014) and a reformed United Nations Trusteeship Council (Biermann 2014; Kim and Bosselmann 2015; see also Chapter 13). Some proposals have eventually been adopted. For example, the upgrading of the Governing Council of the United Nations Environment Programme to the United Nations Environment Assembly with universal membership was a significant political outcome of the 2012 United Nations Conference on Sustainable Development in

Rio de Janeiro. Recently, the International Law Commission has considered the case for a law of the atmosphere (Sand and Wiener 2016; Sand 2017). And international discussions are underway on a Global Pact for the Environment (Kotzé and French 2018), intended to become a framework agreement of international environmental law.

A new trend in this debate is the turn to more integrative and systems analysis in addressing the question of *how* to transform. A serious answer to this question requires a thorough understanding of the structure and dynamics of the architecture in question. One approach perceives an architecture as a system of international institutions and seeks to work towards transformation by targeting key leverage points in the system (Meadows 2008). Leverage points are places in a system where actors can intervene and create radical shifts in its structure or function with relatively little effort. For example, systems analysis has advanced to the point where we can pinpoint missing links between key institutions. Researchers do not simply suggest that we need more policy and institutional coherence, but now identify which exact ‘dots’ need to be connected (van Asselt and Zelli 2013) or which linkages need to be strengthened for maximum transformative effects (Jinnah 2011; Abbott 2014; Betsill et al. 2015).

Overall, years of analysis back up an emerging scientific consensus on the need for major transformations in the architecture of earth system governance and a ‘constitutional moment’ in world politics that could possibly even include amendments to the Charter of the United Nations (Biermann et al. 2012; Kanie et al. 2012). Similar suggestions have been made for international environmental law (Kotzé 2012, 2016), based on the conclusion that that body of law lacks a clear goal, which is at least in part responsible for its ineffectiveness (Bodansky 2009; Kim and Bosselmann 2013). While these proposals would intervene at the level of the governance architecture, other analyses suggest even more fundamental paradigm shifts. For instance, some scholars make a case for going beyond environmental rights (Boyd 2012; Gellers 2015) to recognizing the rights of nature, as seen in recent examples in certain national jurisdictions (Boyd 2017). A proposal for transforming the architecture of earth system governance by introducing sustainability as a fundamental norm on par with equality, freedom and justice is another example (Bosselmann 2017; see also Chapter 13).

In this line of investigation, we observe an emerging trend of linking the literature on governance architectures with the literature on transformative governance. The transformative governance approach is intended to respond to, manage and trigger regime shifts in coupled socio-ecological systems, at multiple scales (Chaffin et al. 2016). Therefore, reforming a governance architecture would have to consider not only transformation *in* global governance, but also what sorts of complex impacts on the earth system the reform would aim to achieve. For

example, scholars have suggested structural reforms that would create conditions for the effective governance of interacting planetary boundaries (Galaz et al. 2012a, 2012b).

Conceptually differentiating between governance *of* and *for* transformation can be useful in this respect (Patterson et al. 2017). Governance *for* transformation is governance that creates the necessary institutional conditions for transformation in socio-technical-ecological systems to emerge. This is an indirect, bottom-up way of transformation by, for example, identifying key barriers to change and removing them. Governance *of* transformation refers to top-down modes of governance that actively trigger transformation and steer its trajectory. The two concepts are not mutually exclusive. For example, a governance measure might actively trigger a major reform, which in turn creates necessary conditions for socio-technical-ecological transformation. According to one study, for example, the emergence of a modular governance architecture has created enabling conditions for transnational standard-setters to govern sustainability transitions (Manning and Reinecke 2016). Another prominent example could be the Sustainable Development Goals, which may have created conditions for societal transformation, yet at the same time may also exert top-down steering effects that need to be assessed in-depth (Stevens and Kanie 2016; see also Chapter 12).

Research Strategies

In addition to the substantive trends discussed above, we see an emerging trend of broadening the scope of research on earth system governance architectures beyond the confines of traditional international relations research. Yet we still see a need to expand research strategies further to a much broader ambit.

One notable trend is expanding research towards more collaborative programmes based on interdisciplinarity. Often, researchers work on a project together, each with their own disciplinary backgrounds. However, integrating these perspectives still better, within and beyond Western knowledge practices, carries the potential for further innovation, even though transcending disciplines may also mean losing clear standards by which research on global governance architectures is judged.

In addition, transdisciplinary approaches that involve non-academic stakeholders in research have become more prominent as well. Societal actors are important, for example, to highlight problems that should shape research agendas. While not all science must be immediately 'policy-relevant', if architecture science does hold some emancipatory potential, then this should be directed at the problems that concern society the most, whether this be the fragmentation of legal rules or the democratic deficit of global governance. Societal actors can also contribute to the 'co-production' of knowledge (Jentoft, McCay and Wilson

1998; Jasanoff 2004) and to identifying solutions that reduce inequality, increase capacity, foster legitimacy and improve effectiveness.

Overall, we see a number of areas for the further development of research strategies in this field.

First, we need more collaboration and dialogue among researchers who study different elements and processes of earth system governance architectures. Knowledge of particular aspects of an architecture often remains isolated in bubbles. The separate strands of research on, for example, international institutions and their interlinkages at the micro level, regime complexes at the meso level and governance architectures at the macro level should more frequently be brought together. New holistic insights may emerge through *research on the cross-level dynamics* within an architecture.

Second, holistic insights may also arise from more empirical analysis, which we see as imperative to advance theory. In particular, many scholars have highlighted the importance of more *systematic comparative approaches*. Here, comparison is not limited to individual institutions and their dyadic relationships, but includes comparison of larger structures such as regime complexes and entire governance architectures. Comparative analysis will help explain why certain structures are, for example, more or less fragmented, and what that means for a range of characteristics of interest, including their performance. This again requires a stronger emphasis on global interdependencies. The architectures of earth system governance have become more complex over the years, increasing the interdependence of international institutions. If actions in one institution affect the performance of another, the effectiveness of individual institutions cannot be explained without accounting for their interdependency. Future research needs to pay more attention to *complex interdependencies* when assessing and optimizing the performance of both individual institutions and governance architectures.

In this context, it remains important to better integrate research on intergovernmental institutions with research on non-state actors and their transnational networks, focusing on how each of them shapes and is shaped by the architectures of earth system governance. The past decade has witnessed an explosion of private codes, schemes and partnerships, and more research is needed on the impacts of these relatively new institutions. Furthermore, concerns over their legitimacy have been documented in several chapters of this book; this must be examined systematically in relation to equity and justice concerns.

Third, these approaches require expanding the *methodological toolbox* of governance scholars, including greater reliance on combinations of methods. For example, social network analysis has become popular in studying earth system governance architectures (Kim 2013; Hollway and Koskinen 2016; Widerberg 2016). More traditional methods might also need adjustments, and better

integration, in mixed-methods approaches that investigate larger sets of actors and institutions. Traditional statistical inference, such as regression analysis, typically assumes a sample of independent observations or treats any potential dependence as nuisance. But the premise of the study of governance architectures is that the actors and institutions constituting the architecture are interdependent. This should make statistical network models, which not only account for observational dependencies but actually highlight them, particularly attractive. A range of statistical network models are now available for different purposes (Block, Stadtfeld and Snijders 2016; Block et al. 2018), including tie-based (Butts 2008; Lusher, Koskinen and Robins 2013) and actor-oriented models (Snijders, van de Bunt and Steglich 2010; Stadtfeld, Hollway and Block 2017).

More fundamentally, research on the architectures of earth system governance can contribute to society by highlighting the global structures that constrain governance and identifying actors and points of agency through which these structures can be changed. Such research not only can inform judicious governance choices, but can also have emancipatory potential. In the Anthropocene, as we move rapidly towards a warmer world, requiring societies to adapt, research on global governance architectures should consider the potential for structural institutional reform.

Finally, research on governance architectures can also make durable societal contributions through education. Highlighting global governance constraints and agency to students or the public can raise awareness, strengthen knowledge and promote thinking critically and creatively. Active learning may help, but most existing simulations and case-study exercises were designed for the study of a single negotiation or problem, not the long-run evolution of entire architectures. Global governance architectures – macro-level webs of principles, institutions and practices – can appear remote, clinical, complicated and slow to change. In competition with the latest and loudest news, emotionally manipulative ‘big lies’ and scandals of a ‘post-truth’ era (Peters 2017), architectures may lose attention. The didactic challenge will be to find ways to render complex global governance architectures more comprehensible.

Reforming Governance Architectures

While most chapters in this volume discuss some policy reforms, they generally focus on detailed analysis of existing architectures and their elements; broader governance transformations have not been central. In this section, therefore, we explore such larger transformations. We rely here on two assessments that large groups of leading scholars associated with the Earth System Governance Project compiled in 2012 and 2017, with a view to sketching far-reaching transformations

of the architectures of global governance (Biermann et al. 2012; Earth System Governance Project 2017). The groups concluded in these reports that incrementalism – the main approach so far – will not suffice to stimulate societal change at the level and speed needed. The challenges of the Anthropocene require instead novel institutional strategies that are bolder in scope, swifter in implementation and more adaptive in character. The group offered an ambitious roadmap for institutional change and the fundamental reform of governance architectures, combining reform proposals that could be achieved within just a decade with others that are more far-reaching.

First, the author team from the Earth System Governance Project argued for a global constitutive agreement that would draw on key principles enshrined in the outcomes of the major conferences in Stockholm (1972) and Rio de Janeiro (1992), as well as in human rights and other treaty regimes, merging them into a constitutional framework that would fill the normative gaps left by the 1945 United Nations Charter (Chapter 13). Such a contract could be a stand-alone document, or could become an integral part of the United Nations system. The constitutive agreement could resolve current normative conflicts between economic, social and environmental institutions and help mainstream social and environmental standards into economic institutions, hence reducing the adverse impacts of economic globalization and global governance fragmentation (Chapter 8). Treaty norms could be clustered more systematically around the interlinkages among our planet's socio-ecological systems. Concretely, the proposed architecture would nest international institutions under a limited number of global umbrella treaties. Similar nesting processes already take place, for instance with respect to the international regulation of hazardous wastes and biodiversity, where multiple treaty secretariats coordinate decision-making, monitoring and enforcement.

As this book is written, governments are negotiating a Global Pact for the Environment. This is clearly a step in the right direction – even though it is too early to tell how the Pact will be written, what form it will take and what its effects will be. The versions of the Pact currently under discussion, however, would most likely not have the full integrative impact that the earth system governance research community originally called for (see Kotzé and French 2018, Kotzé 2019 and our discussion in Chapter 13).

Second, the group proposed to strengthen the integration of sustainable development organs and agencies through a new World Sustainable Development Council within the United Nations (Biermann et al. 2012, Biermann 2014, Earth System Governance Project 2017). This council would be built on the ethics of planetary stewardship and given an earth trusteeship mandate, reflecting the deep-rooted idea that states should act as trustees of the earth (Kim and Bosselmann 2015). In addition to states, a chamber of the council could be devoted to civil

society, including non-governmental organizations and scientific communities. As trustee of the earth, the council could ensure that the entire spectrum of human rights is respected, and that countries share rights, responsibilities and risks in accordance with the precautionary principle and the principle of common but differentiated responsibilities and respective capabilities.

To be effective, this council could rely not only on traditional modes of geographical representation, but should give special prominence to the 20 largest economies in North and South. These states could hold at least 50 per cent of votes in the council, with the other 50 per cent reserved for representatives of smaller countries (Biermann et al. 2012). A strong role for the largest economies would allow the World Sustainable Development Council to have a meaningful influence in areas such as economic and trade governance. The 20 largest economies in North and South – broadly represented today by the Group of 20 – represent about two-thirds of the world's population and around 90 per cent of global gross national product, justifying their role.

At the 2012 United Nations Conference on Sustainable Development, governments agreed to establish the High-level Political Forum on Sustainable Development to fulfil a similar role. Yet its structure is very different, and several scholars doubt its future significance, although, again, it is too early to tell whether the High-level Political Forum will succeed as an orchestrator of global governance (see our discussions in, Chapter 11, Chapter 12 and Chapter 13).

In addition, the original United Nations Charter and institutional system made no provision for the protection of planetary ecological systems. The only adjustment has been the creation of the United Nations Environment Programme in 1972, which has not – despite all efforts by its dedicated staff and funders – managed to live up to the long-term challenges of the Anthropocene. Effective earth system governance requires a powerful organ that focuses on planetary ecological concerns. The governance architecture that researchers from the Earth System Governance Project proposed would hence include a strong world environment organization, initially along the lines of the World Health Organization or the International Labour Organization (Biermann et al. 2012; Earth System Governance Project 2017). This approach has been supported by the African Union, European Union and other governments. To be sure, the United Nations Environment Programme has been strengthened in recent years, making it a more effective and independent agency, for instance by establishing the United Nations Environment Assembly with universal membership. This body may perform some of the functions suggested for a world environment organization (Chapter 3). Still, further strengthening of the 'environmental pillar' of the global governance system seems essential.

Third, the group of earth system governance scholars argued for more general reforms of international institutions as well. The dynamic nature of Anthropocene challenges requires that international institutions be more adaptive in responding to change, both in socio-ecological problems and in our knowledge of their nature and causes. International fisheries treaties face quite different challenges than they did 20, let alone 50, years ago: greater threats from marine pollution, warming sea temperatures and ocean acidification; increased demand for fish, size of fleets and efficiency of technologies; and improved knowledge of fish stocks and population biodynamics. Managing dynamic problems like these effectively requires dynamic and responsive institutions.

Numerous short-term actions could be taken, for example, introducing procedures that ensure that new scientific information is quickly taken up, or that systematically collect and review information about a treaty's impact. Such measures, however, would lead only to incremental improvements. While the search for incremental change is important, it is not enough. The earth system governance researchers therefore recommended transformative changes in international decision-making, making it more democratic, more adaptive, and more rapidly implemented, with fewer veto points. More precisely, the group advocated stronger reliance on qualified majority voting. Political systems that build on such a majority-based rule arrive more quickly at more far-reaching decisions. Earth system transformation is too urgent to be left to the veto power of individual countries, as is the case under the consensus decision rules common in many treaties. However, it is also evident that qualified majority voting with binding effect is rare in international politics, so this approach must be further developed (Biermann 2014; Kemp 2014).

Fourth, stronger global institutions raise important questions of legitimacy and accountability. Governance through United Nations-type institutions tends to give a large role to international and domestic bureaucracies, at the expense of national parliaments and direct citizen involvement. Accountability can be strengthened by granting stakeholders better access to decision-making, through special rights enshrined in agreements, or through stronger participation in councils that govern resources and commissions that hear complaints. Greater transparency would empower citizens and consumers to hold governments and businesses accountable, providing incentives for better governance (Gupta and Mason 2014). The inclusive negotiations around the Sustainable Development Goals in 2012–2015 are a valuable example (Chapter 12). Stronger consultative rights in intergovernmental institutions for civil society representatives, parliamentarians and citizens could also be a step forward. However, this would require the development of transparent and effective accountability mechanisms for civil society representatives vis-à-vis their constituencies, as well as mechanisms to account for imbalances in the

strength of civil society across countries from North to South, and for power and resource differentials across segments of civil society.

The author team from the Earth System Governance Project (2017) hence proposed a polycentric, pluriform system of global accountability that would complement the United Nations General Assembly with additional assemblies representing the parliaments, civil society organizations and citizens of the world. These might include a Global Parliamentary Assembly, modelled on regional parliamentary assemblies in South America, Africa and Europe; a Global Assembly of Civil Society, modelled on regional bodies such as the European Social and Economic Committee, which integrates unions, employers and other societal representatives in regional decision-making; and a Global Citizens Assembly, which would bring together individual citizens, who could even be selected through random drawings (Dryzek, Bächtiger and Milewicz 2011). In addition, the group argues for a High Commissioner of Future Generations, who would have speaking rights in international institutions and could provide guidance as to their long-term impacts (Pearce 2012). Finally, the proposed governance architecture would open other global institutions for meetings and assemblies of representatives of cities and federal states. This polycentric, pluriform system of global deliberation and decision-making would allow for a much more representative, deliberative and hence accountable and legitimate system of global cooperation.

Fifth, global cooperation goes beyond intergovernmental agreements. Vast networks of non-state initiatives led by industry, activists and scientists, multisectoral partnerships and cities has sprung up, giving new strength and enthusiasm to global cooperation (Chapter 4). Such governance ‘beyond the state’ can help avoid capture by powerful interests. Yet to be effective, non-governmental initiatives require the involvement of multiple stakeholders, appropriate national regulatory frameworks and accountability mechanisms, along with strong consumer demand – all of which are not always present. Transnational labelling schemes cover a sizable share of global markets only for a handful of goods; so far they hardly offer a solution to sustainability problems such as forest conservation and poverty eradication (International Institute for Sustainable Development 2014). Thus, the proposed governance architecture would provide for novel cooperative frameworks that promote successful non-state-driven, transnational governance: regulations that create incentives for firms to seek certification; better-focused procurement policies; stronger legitimation; and better monitoring of sustainability effects. International organizations could play a powerful role in catalyzing and steering novel forms of private and public-private governance (Abbott and Snidal 2010).

Sixth, the group argued that special attention must be paid to the poorest billion of humankind, who will suffer most from earth system transitions and global economic changes. Policies are rarely made *by* poor and marginalized people – they are made only *for* poor people, by others who believe they understand or represent poor people’s preferences and aspirations. Global policy processes that affect poor and marginalized people must thus as far as possible enable those people’s participation in preparation, implementation, monitoring and adaptation. While the traditional dichotomy of ‘North’ and ‘South’ may be less relevant today, extremely high consumption levels in industrialized countries and in some parts of emerging economies require special and urgent action (Lebel, Lorek and Daniel 2010), while many poorer societies and marginalized groups lack the capacities to take forceful action in mitigating and adapting to global environmental change. Overall, strong financial and technological support for poorer countries remains an inevitable part of an effective earth system governance architecture.

Conclusions

‘The mother art is architecture. Without an architecture of our own we have no soul of our own civilization.’ This statement – attributed to Frank Lloyd Wright – also applies to architectures of earth system governance. While individual actions count, individual institutions matter, and each negotiation or political process has value – in the end, it is governance architectures that determine political outcomes. Architectures comprising diverse institutions that interact in numerous ways create structural power that affects our societies and all humankind. Global governance architectures may sometimes create inequalities, but they can also be a source of transformation. They shape the structure of global trade; the freedom of maritime transport; the flows of global communication; the stocks of global fisheries; and last but not least, the global politics surrounding the ongoing climate crisis, the destruction of our planet’s biological diversity, and myriad other issues of earth system transformation.

Yet overall, the social sciences still lack sufficient knowledge about the emergence, dynamics and impacts of global governance architectures. This book was designed to address that gap. We have sought to increase conceptual clarity; synthesize a decade of intense research; and chart directions for future research. While the volume surely has not provided conclusive answers to all the problems identified, it has made one point clear: global governance architectures are of utmost importance. The ‘architecture lens’ offers a bird’s-eye view on the global governance landscape that is highly valuable in explaining outcomes of world politics. As a result, the governance architecture research programme will continue to flourish.

References

- Abbott, K. W. (2014). Strengthening the transnational regime complex for climate change. *Transnational Environmental Law*, 3, 57–88.
- Abbott, K. W., Green, J. F., & Keohane, R. O. (2016). Organizational ecology and institutional change in global governance. *International Organization*, 70, 247–77.
- Abbott, K. W., & Snidal, D. (2010). International regulation without international government: Improving IO performance through orchestration. *Review of International Organizations*, 5 (3), 315–44.
- Aligica, P. D., & Tarko, V. (2011). Polycentricity: From Polanyi to Ostrom, and beyond. *Governance*, 25 (2), 237–62.
- Axelrod, M. (2014). Clash of the treaties: Responding to institutional interplay in European Community–Chile Swordfish negotiations. *European Journal of International Relations*, 20, 987–1013.
- Axelrod, R., & Cohen, M. D. (1999). *Harnessing complexity: Organizational implications of a scientific frontier*. New York: The Free Press.
- Barabási, A.-L. (2005). Taming complexity. *Nature Physics*, 1, 68–70.
- Betsill, M. M., Dubash, N. K., Paterson, M., van Asselt, H., Vihma, A., & Winkler, H. (2015). Building productive links between the UNFCCC and the broader global climate governance landscape. *Global Environmental Politics*, 15, 1–10.
- Biermann, F. (2000). The case for a world environment organization. *Environment*, 42, 22–32.
- Biermann, F. (2014). *Earth system governance. World politics in the Anthropocene*. Cambridge, MA: The MIT Press.
- Biermann, F., & Bauer, S. (eds.) (2005). *A world environment organization: Solution or threat for effective international environmental governance?* Aldershot: Ashgate.
- Biermann, F., Abbott, K. W., Andresen, S., et al. (2012). Navigating the Anthropocene: Improving earth system governance. *Science*, 335, 1306–7.
- Biermann, R. (2008). Towards a theory of inter-organizational networking: The Euro-Atlantic security institutions interacting. *Review of International Organizations*, 3, 151–177.
- Biermann, R., & Koops, J. A. (eds.) (2017). *Palgrave handbook of inter-organizational relations in world politics*. London: Palgrave Macmillan.
- Block, P., Stadtfeld, C., & Snijders, T. AB. (2016). Forms of dependence: Comparing SAOMs and ERGMs from basic principles. *Sociological Methods and Research*, 48 (1), 202–39.
- Block, P., Koskinen, J., Hollway, J., Steglich, C., & Stadtfeld, C. (2018). Change we can believe in: Comparing longitudinal network models on consistency, interpretability and predictive power. *Social Networks*, 52, 180–91.
- Bodansky, D. (2009). Is there an international environmental constitution? *Indiana Journal of Global Legal Studies*, 16, 565–84.
- Bosselmann, K. (2017). *The principle of sustainability: Transforming law and governance*. London: Routledge.
- Bouteligier, S. (2011). Exploring the agency of global environmental consultancy firms in earth system governance. *International Environmental Agreements*, 11, 43–61.
- Boyd, D. R. (2012). The constitutional right to a healthy environment. *Environment*, 54, 3–15.
- Boyd, D. R. (2017). *The rights of nature: A legal revolution that could save the world*. Toronto: ECW Press.

- Boyd, E., & Folke, C. (eds.) (2012). *Adapting institutions: Governance, complexity and social-ecological resilience*. Cambridge, UK: Cambridge University Press.
- Butts, C. T. (2008). A relational event framework for social action. *Sociological Methodology*, 38 (1), 155–200.
- Chaffin, B. C., Garmestani, A. S., Gunderson, L. H., et al. (2016). Transformative environmental governance. *Annual Review of Environment and Resources*, 41, 399–423.
- Colgan, J. D., Keohane, R. O., & Van de Graaf, T. (2012). Punctuated equilibrium in the energy regime complex. *Review of International Organizations*, 7, 117–43.
- Conant, R. C., & Ashby, W. R. (1970). Every good regulator of a system must be a model of that system. *International Journal of Systems Science*, 1, 89–97.
- Dellas, E., Pattberg, P., & Betsill, M. M. (2011). Agency in earth system governance: Refining a research agenda. *International Environmental Agreements*, 11, 85–98.
- Drezner, D. W. (2009). The power and peril of international regime complexity. *Perspectives on Politics*, 7, 65–70.
- Dryzek, J. S., Bächtiger, A., & Milewicz, K. (2011). Toward a deliberative global citizens' assembly. *Global Policy*, 2, 33–42.
- Duit, A., & Galaz, V. (2008). Governance and complexity: Emerging issues for governance theory. *Governance: An International Journal of Policy, Administration, and Institutions* 21 (3), 311–35.
- Duit, A., Galaz, V., Eckerberg, K., & Ebbesson, J. (2010). Governance, complexity and resilience. *Global Environmental Change*, 20 (3), 363–8.
- Earth System Governance Project (2017). *Submission to the Global Challenges Foundation*. Stockholm: Global Challenges Foundation.
- Eilstrup-Sangiovanni, M. (2018). Death of international organizations: The organizational ecology of intergovernmental organizations, 1815–2015. *Review of International Organizations*, 70, 1–32.
- Elliott, L. (2017). Cooperation on transnational environmental crime: Institutional complexity matters. *Review of European, Comparative & International Environmental Law*, 26, 107–17.
- Galaz, V., Biermann, F., Crona, B., et al. (2012a). 'Planetary boundaries' – exploring the challenges for global environmental governance. *Current Opinion in Environmental Sustainability* 4 (1), 80–7.
- Galaz, V., Crona, B., Österblom, H., Olsson, P., & Folke, C. (2012b). Polycentric systems and interacting planetary boundaries: Emerging governance of climate change–ocean acidification–marine biodiversity. *Ecological Economics*, 81, 21–32.
- Gehring, T., & Oberthür, S. (2009). The causal mechanisms of interaction between international institutions. *European Journal of International Relations*, 15, 125–56.
- Gellers, J. C. (2015). Explaining the emergence of constitutional environmental rights: A global quantitative analysis. *Journal of Human Rights and the Environment*, 6, 75–97.
- Green, J. F. (2013). Order out of chaos: Public and private rules for managing carbon. *Global Environmental Politics*, 13, 1–25.
- Green, J. F., & Auld, G. (2016). Unbundling the regime complex: The effects of private authority. *Transnational Environmental Law*, 6, 259–84.
- Greenhill, B., & Lupu, Y. (2017). Clubs of clubs: Fragmentation in the network of intergovernmental organizations. *International Studies Quarterly*, 61, 181–95.
- Gulbrandsen, L. H. (2009). The emergence and effectiveness of the Marine Stewardship Council. *Marine Policy*, 33, 654–60.
- Gupta, A., & Mason, M. (eds.) (2014). *Transparency in global environmental governance. Critical perspectives*. Cambridge, MA: The MIT Press.

- Hall, N. (2015). Money or mandate? Why international organizations engage with the climate change regime. *Global Environmental Politics*, 15, 79–97.
- Hall, N. (2016). *Displacement, development and climate change: International organizations moving beyond their mandates*. London: Routledge.
- Hall, P. A. (2010). Historical institutionalism in rationalist and sociological perspective. In J. Mahoney, & K. Thelen (eds.), *Explaining institutional change: Ambiguity, agency, and power* (pp.204–24). Cambridge, UK: Cambridge University Press.
- Hickmann, T. (2017). The reconfiguration of authority in global climate governance. *International Studies Review*, 19 (3), 430–51.
- Hirsch, P. D., Adams, W. M., Brosius, J. P., Zia, A., Bariola, N., & Dammert, J. L. (2011). Acknowledging conservation trade-offs and embracing complexity. *Conservation Biology*, 25, 259–64.
- Hollway, 2015#
- Hollway, J., & Koskinen, J. (2016). Multilevel embeddedness: The case of the global fisheries governance complex. *Social Networks*, 44, 281–94.
- Jasanoff, S. (2004). *States of knowledge: The co-production of science and the social order*. London: Routledge.
- Jentoft, S., McCay, B. J., & Wilson, D. C. (1998). Social theory and fisheries co-management. *Marine Policy*, 22 (4–5), 423–36.
- Jinnah, S. (2011). Climate change bandwagoning: The impacts of strategic linkages on regime design, maintenance, and death. *Global Environmental Politics*, 11, 1–9.
- Jóhannsdóttir, A., Cresswell, I., & Bridgewater, P. (2010). The current framework for international governance of biodiversity: Is it doing more harm than good? *Review of European, Comparative and International Environmental Law*, 19, 139–49.
- Jordan, A. J., Huitema, D., Hildén, M., et al. (2015). Emergence of polycentric climate governance and its future prospects. *Nature Climate Change*, 5, 977–82.
- Jordan, A., Huitema, D., Schoenefeld, J., van Asselt, H., & Forster, J. (2018). Governing Climate Change polycentrically: Setting the scene. In A. Jordan, D. Huitema, H. van Asselt, & J. Forster (eds.), *Governing climate change: Polycentricity in action?* (pp. 3–26). Cambridge, UK: Cambridge University Press.
- Kalfagianni, A., & Pattberg, P. (2013). Fishing in muddy waters exploring the conditions for effective governance of fisheries and aquaculture. *Marine Policy*, 38, 124–32.
- Kanie, N., Betsill, M. M., Zondervan, R., Biermann, F., & Young, O. R. (2012). A charter moment: Restructuring governance for sustainability. *Public Administration and Development*, 32, 292–304.
- Kemp, L. (2014). Framework for the future? Exploring the possibility of majority voting in the climate negotiations. *International Environmental Agreements*, 16, 757–79.
- Kettl, D. F. (2015). *The transformation of governance: Public administration for the twenty-first century*. Baltimore, MD: John Hopkins University Press.
- Kim, R. E. (2013). The emergent network structure of the multilateral environmental agreement system. *Global Environmental Change*, 23 (5), 980–91.
- Kim, R. E., & Bosselmann, K. (2013). International environmental law in the Anthropocene: Towards a purposive system of multilateral environmental agreements. *Transnational Environmental Law*, 2, 285–309.
- Kim, R. E., & Bosselmann, K. (2015). Operationalizing sustainable development: Ecological integrity as a Grundnorm of international law. *Review of European, Comparative & International Environmental Law*, 24, 194–208.
- Kim, R. E., & Mackey, B. (2014). International environmental law as a complex adaptive system. *International Environmental Agreements*, 14, 5–24.

- Kotzé, L. J. (2012). Arguing global environmental constitutionalism. *Transnational Environmental Law*, 1, 199–233.
- Kotzé, L. J. (2016). *Global environmental constitutionalism in the Anthropocene*. Portland: Bloomsbury Publishing.
- Kotzé, L. J., & French, D. (2018). A critique of the global pact for the environment: A stillborn initiative or the foundation for *Lex Anthropocenae*? *International Environmental Agreements*, 18, 811–88.
- Kotzé, L. J. (2019). International environmental law's lack of normative ambition: An opportunity for the Global Pact and its Gap Report?. *Journal of European Environmental and Planning Law*, in press.
- Lebel, L., Lorek, S. & Daniel, R. (eds.) (2010). *Sustainable production consumption systems: Knowledge, engagement and practice*. Dordrecht: Springer Dordrecht.
- Le Prestre, P. (2017). *Global ecopolitics revisited: Toward a complex governance of global environmental problems*. London: Routledge.
- Lubell, M. (2013). Governing institutional complexity: The ecology of games framework. *Policy Studies Journal*, 41, 537–59.
- Lusher, D., Koskinen, J., & Robins, G. (2013). *Exponential random graph models for social networks: Theory, methods, and applications*. Cambridge, UK: Cambridge University Press.
- Manning, S., & Reinecke, J. (2016). A modular governance architecture in-the-making: How transnational standard-setters govern sustainability transitions. *Research Policy*, 45, 618–33.
- Marcoux, C. (2011). Understanding institutional change in international environmental regimes. *Global Environmental Politics*, 11, 145–51.
- Meadows, D. H. (2008). *Thinking in systems: A primer*. White River Junction: Chelsea Green.
- Morin, J. F. (2018). Concentration despite competition: The organizational ecology of technical assistance providers. *Review of International Organizations*, 70, 1–33.
- Morin, J. F., Pauwelyn, J., & Hollway, J. (2017). The trade regime as a complex adaptive system: Exploration and exploitation of environmental norms in trade agreements. *Journal of International Economic Law*, 20, 365–90.
- Mukhtarov, F., & Gerlak, A. K. (2013). River basin organizations in the global water discourse: An exploration of agency and strategy. *Global Governance*, 19, 307–26.
- Najam, A. (2000). Future directions: The case for a 'Law of the Atmosphere'. *Atmospheric Environment*, 34, 4047–9.
- Newell, P., Pattberg, P., & Schroeder, H. (2012). Multiactor governance and the environment. *Annual Review of Environment and Resources*, 37, 365–87.
- Nilsson, M., & Persson, Å. (2012). Can earth system interactions be governed? Governance functions for linking climate change mitigation with land use, freshwater and biodiversity protection. *Ecological Economics*, 81, 10–20.
- O'Brien, K. (2012). Global environmental change II: From adaptation to deliberate transformation. *Progress in Human Geography*, 36, 667–76.
- Oberthür, S. (2009). Interplay management: enhancing environmental policy integration among international institutions. *International Environmental Agreements*, 9 (4), 371–91.
- Oberthür, S., & Stokke, O. S. (eds.) (2011). *Managing institutional complexity: Regime interplay and global environmental change*. Cambridge, MA: The MIT Press.
- Orsini, A., Morin, J. F., & Young, O. R. (2013). Regime complexes: A buzz, a boom or a boost for global governance? *Global Governance*, 19 (1), 27–39.

- Patterson, J., Schulz, K., Vervoort, J., et al. (2017). Exploring the governance and politics of transformations towards sustainability. *Environmental Innovation and Societal Transitions*, 24, 1–16.
- Pauwelyn, J. (2014). At the edge of chaos? Foreign investment law as a complex adaptive system, how it emerged and how it can be reformed. *ICSID Review*, 29 (2), 263–88.
- Pearce, C. (2012). Ombudspersons for future generations: A proposal for Rio+20. *UNEP: Perspectives*, 6, 1–12.
- Peters, M. A. (2017). Education in a post-truth world. *Educational Philosophy and Theory*, 49 (6), 563–6.
- Pickering, J., Betzold, C., & Skovgaard, J. (2017). Managing fragmentation and complexity in the emerging system of international climate finance. *International Environmental Agreements*, 17, 1–16.
- Rabitz, F. (2017). *The global governance of genetic resources: Institutional change and structural constraints*. London: Routledge.
- Ruhl, J. B. (2008). Law's complexity: A primer. *Georgia State University Law Review*, 24, 885–911.
- Ruhl, J. B. (2012). Panarchy and the law. *Ecology and Society*, 17.
- Ruhl, J. B., Katz, D. M., & Bommarito, M. J. (2017). Harnessing legal complexity. *Science*, 355, 1377–8.
- Sand, P. H. (2017). The discourse on 'protection of the atmosphere' in the International Law Commission. *Review of European, Comparative & International Environmental Law*, 26 201–9.
- Sand, P. H., & Wiener, J. B. (2016). Towards a new international law of the atmosphere. *Göttingen Journal of International Law*, 7, 195–223.
- Schroeder, H. (2010). Agency in international climate negotiations: The case of indigenous peoples and avoided deforestation. *International Environmental Agreements*, 10, 317–32.
- Snijders, T. A. B., van de Bunt, G. G., & Steglich, C. E. G. (2010). Introduction to stochastic actor-based models for network dynamics. *Social networks*, 32 (1), 44–60.
- Stadtfeld, C., Hollway, J., & Block, P. (2017). Dynamic network actor models: Investigating coordination ties through time. *Sociological Methodology*, 47 (1), 1–40.
- Stevens, C., & Kanie, N. (2016). The transformative potential of the Sustainable Development Goals (SDGs). *International Environmental Agreements*, 16, 393–6.
- Teisman, G., & Gerrits, L. (2014). The emergence of complexity in the art and science of governance. *Complexity, Governance and Networks*, 1 (1), 17–28.
- Tomozeiu, D., & Joss, S. (2014). Adapting adaptation: The English eco-town initiative as governance process. *Ecology and Society*, 19.
- Underdal, A. (2010). Complexity and challenges of long-term environmental governance. *Global Environmental Change*, 20, 386–93.
- Van Asselt, H., & Zelli, F. (2014). Connect the dots: Managing the fragmentation of global climate governance. *Environmental Economics and Policy Studies*, 16, 137–55.
- Van der Ven, H., Rothacker, C., & Cashore, B. (2018). Do eco-labels prevent deforestation? Lessons from non-state market driven governance in the soy, palm oil, and cocoa sectors. *Global Environmental Change*, 52, 141–51.
- Widerberg, O. (2016). Mapping institutional complexity in the Anthropocene: A network approach. In P. Pattberg, & F. Zelli (eds.), *Environmental politics and governance in the Anthropocene: Institutions and legitimacy in a complex world* (pp. 81–102). London: Routledge.
- Young, O. R. (2002). *The institutional dimensions of environmental change: Fit, interplay, and scale*. Cambridge, MA: The MIT Press.

- Young, O. R. (2010a). *Institutional dynamics: Emergent patterns in international environmental governance*. Cambridge, MA: The MIT Press.
- Young, O. R. (2010b). Institutional dynamics: Resilience, vulnerability and adaptation in environmental and resource regimes. *Global Environmental Change*, 20, 378–85.
- Young, O. R. (2011). Effectiveness of international environmental regimes: Existing knowledge, cutting-edge themes, and research strategies. *Proceedings of the National Academy of Sciences of the United States of America*, 108, 19853–60.
- Young, O. R. (2017). *Governing complex systems: Social capital for the Anthropocene*. Cambridge, MA: The MIT Press.
- Zelli, F., Möller, I., & van Asselt, H. (2017). Institutional complexity and private authority in global climate governance: The cases of climate engineering, REDD+ and short-lived climate pollutants. *Environmental Politics*, 26, 669–93.