



Intergovernmental organizations and climate security: advancing the research agenda

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Climate-related security challenges are transnational in character, leading states to increasingly rely on intergovernmental organizations (IGOs)—such as the European Union and the North-Atlantic Treaty Organization—for policy solutions. While climate security issues do not typically fit comfortably within the mandates of existing IGOs, recent decades have seen increasing efforts by IGOs to link climate change and security. This article reviews existing studies on IGOs' responses to climate security challenges. It draws together research from several bodies of literature spanning political science, international relations, and environmental social science, identifying an emerging field of research revolving around IGOs and climate security. We observe significant advancement in this young field, with scholars extending and enriching our understanding of how and why IGOs address climate security challenges. Yet we still know little about the conditions under which IGOs respond to climate security challenges and when they do so effectively. This article discusses the main gaps in current work and makes some suggestions about how these gaps may be usefully addressed in future research. A better understanding of the conditions under which IGOs respond (effectively) to climate security challenges would contribute to broader debates on climate security, institutional change, and effectiveness in international relations and environmental social science, and may facilitate crafting effective global solutions to society's most intractable climate security challenges.

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INTRODUCTION

Societies worldwide are currently being confronted by a new class of security challenges posed by

climate change. Climate change is undermining the security of states and people in ways that are unprecedented in complexity and spatial reach.¹ Although there is ongoing academic debate about the causal linkages from climate change to conflict,^{2–6} researchers and policymakers widely agree that climate change has exacerbated existing vulnerabilities in already unstable regions by shaping social, political, and economic circumstances.^{7–10} As climate security challenges are typically transnational in character, states are increasingly relying on intergovernmental organizations (IGOs) such as the European Union (EU), the North-Atlantic Treaty Organization (NATO), and the United Nations

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Security Council (UNSC), that is, formal, multilateral, or bureaucratic arrangements established to further cooperation among states (Ref 11, pp. 328–329), for policy solutions.^{12–16}

Research on the mandates, behavior, and effectiveness of IGOs in addressing climate security challenges has burgeoned in response. In several social science subfields spanning political science, international relations (IR), and environmental social science, the questions of how, why, and how effectively IGOs respond to climate security challenges have started to attract scholarly interest over the past decade. Such questions are becoming increasingly relevant in addressing this new class of global climate security problems. States have delegated more and more political authority to IGOs in recent decades, and IGOs in turn are known to affect state behavior through means such as economic coercion, social shaming, information provision, agenda-setting, and norm socialization.¹¹

This article contributes to the increasingly salient debate on global climate security governance by identifying an emerging field of research revolving around IGOs and climate security. This field is rather difficult to delineate due to the many policy areas linked to climate security. Climate security risks interact with each other and span several policy areas, such as security, diplomacy, peace and conflict, development, disaster risk reduction (DRR), and migration.^{17–19} Recent decades have seen increasing efforts by international policymakers to link climate change and security across policy areas, which has resulted in a rise of epistemic communities on climate security that push policymaking in IGOs such as the EU and the United Nations (UN). Although IGOs' responses to climate security issues are still widely understood and framed as a reaction to solve problems in specific policy areas such as security, development, and migration, policymakers are under increasing pressure to adequately address transboundary climate security risks. Thus, they face a sharpened burden of proof in explaining how climate security risks can be effectively addressed by linking governance efforts across policy areas.⁹

With regard to the academic literature on IGOs and climate security, scholars have published in a wide variety of journals and other outlets such as research monographs and edited volumes. It would therefore be unrealistic to expect to get a representative overview by sampling studies only from the highest ranked journals. Such an approach would run the risk to map some prominent scholarship, while ignoring many relevant studies published in more specialist journals. Based on these considerations, this article is

based on the following broad approach to identify relevant studies.

We proceeded in five steps. First, we delimited the time period of this review to 2004–2016, as systematic academic research on climate security challenges gained momentum only after the seminal policy paper on the topic by Schwartz and Randall was published in 2003.²⁰ Second, we used recent policy reports dealing with global climate security challenges to identify central IGOs, policy areas, and keywords, as well as references to related scholarly literature.^{9,17,19,21} Third, we searched for these IGOs, policy areas, and keywords on the web pages of the 10 major journal and book publishing houses in the social sciences, and complemented this search using the EBSCO Host Research Databases search engine. Fourth, we used the bibliographies of the identified studies to select other publications. Fifth, we excluded studies that merely mention that IGOs are important players in global climate security governance, taking into account only those that examine IGO responses to climate security challenges through scientific inquiry (though not necessarily as primary aim of research). Thus, this review includes a total set of 44 studies written in English that each have contributed to knowledge about IGO responses to climate security challenges.

In reviewing these studies, we highlight two generic forms of IGO responses privileged in existing studies, that is, discursive and governance approaches. We observe much advancement, with scholars extending and enriching our understanding of how and why IGOs address climate security challenges. Yet we know little about the conditions under which IGOs respond to climate security challenges, and when they do so effectively. Scholars investigating similar topics are typically not motivated by shared conceptualizations or theoretical outlooks, and provide in-depth knowledge about specific cases of individual IGOs in particular policy areas. There are legitimate reasons for this, as this 'state of the art' reflects the fragmented nature of global climate security governance, where climate security issues do typically not fit comfortably within the mandates of existing IGOs.

Yet new governance arrangements to tackle climate security issues increasingly garner policy space,^{9,17,18,21} which leads us to identify two chief research gaps. First, we know little about integrated governance, referring to the degree to which policymakers involved in different policy areas link climate change and security by cooperating within and across IGOs, and by mainstreaming climate security issues across policy areas.^{22,23} Second, the effectiveness of

IGO responses to climate security challenges is an important research area in need of more theory. The aim of this review is to make suggestions for how these two main shortcomings could be remedied by linking the study of IGOs and climate security to broader lines of theory on institutional change and effectiveness in IR.

CLIMATE SECURITY

'Climate security' is a rather elusive concept that has been defined in many different ways. At a basic level, climate security is commonly referred to as threats to states, societies, and individual citizens, encompassing any threats and risks directly or indirectly caused by climate change.^{7,24} While the conventional definition of security refers to violent and direct intentional acts, climate change typically affects security indirectly by shaping contextual conditions. More particularly, potential effects of climate change on security depend not only on the magnitude of climate change but largely on context-based vulnerabilities related to water and energy infrastructure, interdependencies in supply chain of key commodities, social and political institutions, and ultimately, societies' adaptive capacity. Thus, the multidimensional and multifaceted impacts of climate change imply that different dimensions of security, such as state security and human security, may be simultaneously affected.^{25,26} In line with recent understandings of climate security in the academic and policymaking communities, we define climate security as the condition where people, communities, and states have the capacity to manage stresses emerging from climate change and variability.^{9,24}

Although IGOs' relevance for resolving climate security challenges is increasingly being acknowledged in policymaking communities,^{8,9,17,21} research on global climate security governance is still not widely perceived as a research field in its own right. To give an overview of the compartmentalized social science literature on IGOs and climate security, we categorize existing studies in terms of their main conceptual and empirical foci. We observe three such foci (see Figure 1).

First, previous literature on climate security primarily focuses on two analytically distinct *security notions*: state security and human security. While state security is typically understood as the condition where states have the capacity to manage climate-related threats to safeguard their sovereignty, military strength, and power in the international system, human security is commonly conceived of as the

condition where individuals and communities have the capacity to manage sudden or chronic climate-induced risks such as hunger, disease, and rights violations.^{27,28} Although state and human security are closely intertwined, only few scholars study climate security implications for both security dimensions.^{7,24,29,30} Second, previous research on IGOs and climate security focuses on a set of *policy areas*. State security is the primary focus of studies on security, diplomacy, as well as peace and conflict, whereas human security is predominantly studied in relation to development, DRR, and migration. Third, although most IGOs' mandates span multiple policy areas, existing studies typically link individual IGOs to a specific policy area. These distinctions between notions of security, policy areas, and IGOs reflect ongoing debates about climate security in the policy-making community.^{9,17,18,21}

IGO RESPONSES AND THEIR EFFECTIVENESS

Based on the categorizing framework developed in the previous section, we observe an emerging field of research on IGOs' responses to climate security threats and risks. Previous research has privileged two types of IGO responses: discourse and governance approaches. We discuss each in turn.

IGO Discourse on Climate Security

IGO discourse on climate security challenges mirrors a growing acknowledgment of the security implications of climate change among policymakers.^{8,9,17,21} Trends in IGO discourse on climate security may be understood against the background of a broader literature on security and securitization. This literature provides useful and critical insights for understanding the promises and pitfalls, and potentially unintended consequences, of a security framing of climate change.

Scholars adopting varying epistemological approaches widely agree that climate security issues do not yield readymade interpretations of their nature, scope, and consequences,^{31–33} but that such issues gain in significance as they are recognized and interpreted by political and societal actors as threats to valued objects such as state or human security.³⁴ There is a debate on the different and potentially conflicting interests that actors have when securitizing climate change, and the consequences of specific interest constellations for actual problem solving.^{25,30,35} While securitization is attractive for both governments and IGOs when seeking to legitimize forceful

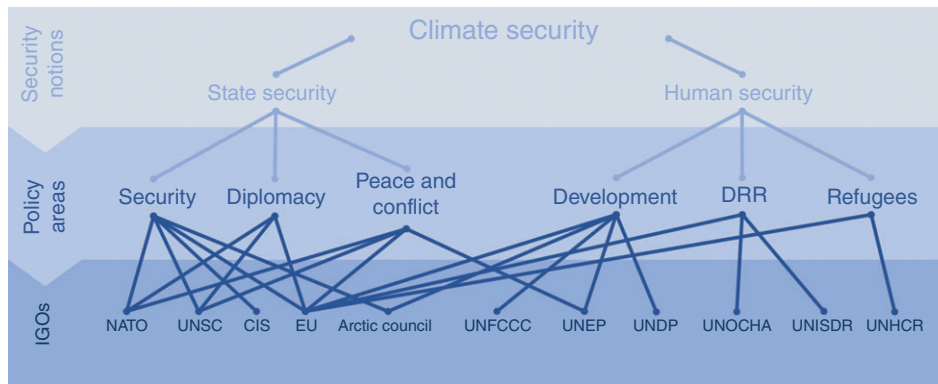


FIGURE 1 | The emerging field of research on IGOs and climate security. Authors' own categorization of conceptual and empirical foci in existing studies on IGOs and climate security.

actions for addressing urgent threats, their interests in securitizing climate change may differ widely.^{36,37} Governments have incentives to securitize climate change 'because it allows them to frame the global challenge of climate change in ways that are familiar to the apparatus of their foreign policy' (Ref 24, p. 280). For example, the securitization of climate conflicts has enabled the US military to increase its influence over development assistance and humanitarian aid.³⁸ With regard to IGOs, climate change has been securitized both in terms of state and human security. Examples include: NATO, which has sought to securitize climate change to safeguard its military force³⁶; the EU, which has made attempts to securitize climate-induced migration (Ref 37, p. 144); and the UNDP, which has focused on the links between climate change and human security.³⁹

However, there is little evidence that climate change has been coherently securitized across IGOs, and scholars debate whether we are witnessing a 'failed securitization' of climate change or a 'climatization' of specific security-related issues such as defense, migration, and development.²⁹ Moreover, the existence of different interests behind securitization raises a larger challenge: given power asymmetries among governments and IGOs, the securitization of climate issues may legitimize actions or policies that disadvantage vulnerable groups in the global South.³⁸ Against this backdrop, the following discussion of the literature on IGOs' discourse on climate security should be read critically in light of the insights from the securitization literature.

Much research on IGOs' discourse on climate security examines how discourse has developed over time, why climate change has been increasingly framed as a security concern,^{40–42} and in what ways actors with diverging interests seek to influence the framing of climate security according to their own

preferences.^{43,44} Moreover, a few studies have inquired about how discourse may shape IGOs' governance responses and their effectiveness.²⁹ Discourse, understood as ways of structuring knowledge and social practices, has been analyzed in our sample of studies from a range of different epistemological (e.g., constructivism and positivism) and theoretical (e.g., structuralism, agency-based and critical analysis) perspectives. While structuralist analyses typically seek to understand the development and consequences of climate security discourse, agency-based analyses intend to capture discourse by specific actors. By contrast, critical approaches usually problematize the effects of discourse on climate security, especially for marginalized groups such as irregular migrants.^{38,45} Empirical evidence comes mostly from the EU and the UNSC, with fewer contributions focusing on other IGOs with a mandate in defense such as NATO, the Commonwealth of Independent States (CIS), and the Arctic Council.^{36,46–48}

With regard to trends and patterns of IGO discourse on climate security, there is mostly evidence on organizations dealing with *state security*. The UNSC has increasingly acknowledged the link between climate change and security,^{30,49–52} with studies focusing particularly on the debates after the very first debate on climate security in 2007.^{53,54} Interestingly, while observers and states remain divided about whether the UNSC is the right forum for discussions on climate change, there is an emerging consensus that the UNSC should address climate change issues.⁵⁵ While opponents argue that climate change is primarily an issue that shapes social development, not security, proponents emphasize the adverse effects climate change will have on international peace and security, implying that these effects would fall under the mandate of the UNSC.^{52,53}

The EU has since 2008 stressed that climate change effects on security are indirect, being moderated by various political, social, and economic factors.^{56–59} In this respect, a relatively small group of diplomats and officials sharing a similar understanding of climate security challenges (i.e., an ‘epistemic community’ on climate security) shaped the EU’s discourse on climate security roughly from the early 2000s until at least 2009.⁶⁰ Several trends in EU discourses on climate security are discernible, such as the securitization of ‘climate refugees,’ diplomacy, and conflict prevention, and the convergence of climate security and energy security.^{37,61–63}

There are comparatively few studies focusing on discourse by IGOs adopting a *human security* approach. Yet there is evidence of the relevance of climate change in development and humanitarian affairs, and of IGOs framing climate change in terms of its consequences for human security and related concepts such as vulnerability. Thus, the United Nations Development Programme (UNDP) has predominantly linked climate change to human development, but has sought to expand its mandate and financial resources in climate change by linking climate change and human security discursively.^{14,64} In the context of migration, the EU has linked the notion of ‘environmental migrants’ to a growing extent to climate change, which has influenced EU policies in Southern Mediterranean countries.⁵⁹

Despite the evidence that some IGOs increasingly frame climate change as a security issue, effective policy responses do not necessarily follow. Whether securitizing climate change generates policy responses and whether they are effective is subject to scholarly debate.²⁹ Indeed, discursive struggles often arise when IGOs seek to advance their overall agenda rather than to address climate security challenges, implying a risk of producing suboptimal policy outcomes and even harmful effects.^{30,36,65,66} For example, although the EU has sought to securitize discourse about migration, it has ‘ultimately failed in bringing about the desired action ... Instead climate-induced migration became subjected to the already existing European machinery of managing and controlling migration’ (Ref 37, p. 144). Furthermore, previous studies of UN agencies such as the UNDP, United Nations Environment Programme (UNEP), and United Nations Office for the Coordination of Humanitarian Affairs (UNOCHA) highlight how framing political issues has contributed to reduce the organizations’ ability to address climate security challenges in the past.⁴⁴ Relatedly, scholars have argued that framings could constrain an IGO’s mandate.⁵² Indeed, framing has hampered the effectiveness of

governance approaches in the past. In the context of the UN, framing the climate change problem as one of law and development, ‘the UN has, for the most part, failed to ... act on environmental problems as matters of peace and international security, or as a component of human rights’ (Ref 52, p. 6). Taken together, these insights are underlined by but typically not explicitly linked to previous insights in a broader social science literature on how discourse shape policy outcomes.^{67,68}

In sum, these studies have significantly advanced our understanding of the motivations for securitizing climate change and the trends and patterns of IGO discourse on climate security. Moreover, previous works have shed light on the roles of actors’ specific communicative framings in shaping the effects of discourse on policy change. Yet we know little about the links between discourse and *effective* IGO responses to climate security challenges. Those studies evaluating the effects of IGO responses do not rely on a common conceptualization of effective governance, hampering theory development on effectiveness. Moreover, there is a methodological preference for single-case studies on discourse by individual IGOs in specific policy areas. While informative for the particular case, these studies tell us little about general patterns and explanations the conditions under which IGO discourse and effective IGO responses to climate security challenges are linked.

IGO Governance on Climate Security

Existing studies on IGO governance focus predominantly on how, with what consequences,⁶⁹ and how effectively⁷⁰ IGOs integrate climate security challenges in their governance approaches. We follow previous scholars in defining governance as systems of rule that are either embodied within formal institutions, or based on intersubjective understandings in informal institutions (Ref 71, p. 426). In other words, institutions are the principles and procedures that shape how actors engage in governance. Most IGOs studied in this body of literature are the EU, UNSC, NATO, and UN agencies with a mandate in environment, development, and humanitarian affairs.

In the context of *state security*, research on NATO has brought to light that the organization has maintained a relatively narrow focus on helping to prepare its members’ military forces to deal with adverse climate change effects.³⁶ By contrast, the EU has a more comprehensive approach to security. Specifically, the setting up of the European External Action Service (EEAS) as of 2010 onward have led some scholars to

suggest that EU crisis management capacities are better suited to address climate security challenges.⁷² Yet others have argued that there are unused opportunities in the EU for developing more coherent governance approaches to adequately address the complexities of climate security challenges.⁷³

In the context of the UN, several studies have focused on the room for governance responses to climate security within the UNSC's mandate.^{49,55,74,75} In this respect, one of the few studies systematically comparing the UNSC, EU, and NATO suggests that both the politicization of climate change issues and the UNSC's weak resource endowment 'make it increasingly difficult to mobilize the coalitions that are needed for international interventions to support those states and regions that are the most vulnerable to the physical impacts of climate change' (Ref 76, p. 82). UNSC responses to climate security challenges vary in terms of whether security is perceived narrowly or broadly,⁷⁶ but also in terms of how the mandate of the UNSC is interpreted.⁵⁵ More generally speaking, in the absence of a broad international agreement on climate-related effects on international security; however, the development of more ambitious and effective governance responses by the UNSC is unlikely.⁷⁶

With regard to *human security*, most research focuses on UN agencies. In the UN, climate stressors are integrated in different policy areas such as development, migration, and DRR with the purpose of addressing human insecurity rather than preventing violent conflicts. Typical governance forms are working groups, departments, and cooperation among policymakers across policy areas on climate security issues. For example, the UNDP started developing governance strategies to address climate-related risks for human security in 2007.⁶⁴ In the area of migration, the UN High Commissioner for Refugees (UNHCR) has sought to address climate-induced displacement of people by participating in UNFCCC negotiations and the Nansen conference. To date, however, the UNHCR's efforts have not led to concrete policy change,^{64,69} as many observers and policymakers perceive climate security challenges to lie outside the organization's core mandate to supervise the Refugee Convention.⁷⁷

A case in point for combining state and human security perspectives is the Environment and Security (ENVSEC) initiative. This partnership, including both traditional security organizations such as NATO and organizations focusing on human security such as UNDP and UNEP, seeks to address conflict risks caused by environmental change in different crisis regions.⁷⁸

Discussing the effectiveness of IGO governance, the literature provides some descriptive evidence. For example, scholars are skeptical that the adoption of a new treaty is the most appropriate solution to make the UNHCR's governance responses more effective, and emphasize the difficulties of clearly defining 'climate refugees'.^{79,80} Others propose the formulation of a UNFCCC Protocol on Climate Refugees.⁸¹ There are a few attempts to shed light on why effective IGO governance in climate security may have been impeded in the past, with existing studies providing some evidence on the impact of integrated governance, and tentative evidence on the role context sensitivity of IGO governance.

To begin with, integrated governance has been pursued in the context of the Arctic Council, NATO, and several UN agencies.^{36,48,82,83} In the state security literature, scholars argue that the risks posed by climate change need to be addressed in IGOs' peacebuilding activities, but that integration can be hampered by factors such as diverging objectives and time frames.⁸⁴ In studies on human security, integrated governance has been discussed as a vital factor in the areas of DRR, climate change adaptation,⁸⁵ and development⁸⁶ for shaping the effectiveness of UN agencies.⁸³ These studies are underpinned by related studies that focus on the field of DRR rather than specific IGOs and that have argued how effective global governance more generally is shaped by integrated governance in the form of fostering cross-community learning processes, developing a common understanding of key concepts, and improving expert knowledge across policy areas.^{87,88} Moreover, context sensitivity of global rules may shape effective IGO governance. In this respect, previous research has criticized insufficient context sensitivity of the mitigation mechanisms promoted by UNFCCC such as crop-based biofuels, and payment for ecosystem services such as the Reduced Emissions from Deforestation and Forest Degradation mechanism. A lack of context sensitivity may have adverse effects in terms of reinforcing conflict among local populations over land rights and natural resources.⁸⁹

Taken together, these studies reveal that IGOs have increasingly engaged in climate security governance. Much research has discussed the establishment and functioning of governance approaches against the background of IGOs' mandates. Yet we lag behind in understanding when IGOs engage in integrated governance in terms of interplay, interactions, or cooperation between policymakers in different IGOs, which is not only of growing importance in climate security governance but also in global governance more generally.⁹⁰ As there are major

differences between IGOs and policy areas in terms of how integrated governance may look like and what the drivers of such governance approaches may be, we need to know more about the generalizability across IGOs and policy areas regarding factors that shape integrated governance approaches. What is more, existing studies are hard-pressed to explain variation in the effectiveness of governance. Previous in-depth case studies using thick descriptions of political processes have identified factors influencing the effectiveness of UN agencies in addressing climate security challenges, but there is a lack of studies reconciling these findings to understand whether these factors are common predictors of effectiveness across IGOs and policy areas.

ADVANCING THE RESEARCH AGENDA ON IGOS AND CLIMATE SECURITY

On the basis of the literature review in the previous section, we observe two chief research gaps. We need more systematic theory development and empirical research on, first, integrated governance approaches, and, second, IGOs' effectiveness in addressing climate security challenges. In the following, we discuss these research gaps and make suggestions for how they could be tackled both theoretically and methodologically.

Explaining Integrated Governance: Conditions for Institutional Change

Existing studies typically describe integrated governance approaches by specific IGOs in specific policy fields, with very few studies analyzing and comparing IGO governance across policy areas.^{44,52,73} However, policymakers have increasingly engaged in integrated governance,⁹⁰ linking climate change and security in both governance and discourse. Prominent examples highlighted in our review include NATO's efforts to address climate change in order to protect its military forces,³⁶ the EEAS's strategy on climate security risks,⁷² UNDP's focus on the negative impacts of climate change,⁶⁴ and the ENVSEC initiative.⁷⁸ Moreover, the increasing visibility of transboundary climate security risks fuels recurring calls to strengthen the coordination between policy areas in environmental peace building,^{25,84} DRR,^{85,86} and climate security.^{9,21} The trend toward more integrated governance has important implications for institutional change in global climate security governance.

Significantly extending our understanding of integrated governance will require theory-driven studies developing and examining theoretical expectations about the drivers of integrated governance. For this purpose, future studies could effectively draw on a broader literature in IR on institutional change. As governance approaches refer to concrete agreements, policies, and formal arrangements embedded in formal or informal institutions that shape actor behavior (Ref 71, p. 426), theories of institutional change may help understanding when and why more concrete governance arrangements occur.

This literature is rooted in realist, liberal, and constructivist research paradigms¹¹ and yields insight into the causes of institutional change that appear across policy areas. Using rational choice institutionalist theories in the realist or liberal tradition, scholars have emphasized several barriers to institutional change, including the rise of new state powers, increasing complexity of policy problems, perceived scientific uncertainty about risks, more complex global governance landscape, cooperation dilemmas, costs for states, and vested state interests in institutions that cement increasingly dysfunctional arrangements, the most prominent example being the UNSC.⁹¹⁻⁹³ Exploring sociological institutionalist theories in the constructivist tradition, organizational cultures of IGOs, norms, ideas, and a lack of common problem definitions, have been shown to cause institutional inertia or even gridlock that may result in resistance to adopting new governance forms.⁹⁴⁻⁹⁶

Building on these theories and their explanatory factors, researchers could examine how such factors combine in explaining integrated governance. For example, do norm- or interest-based hypotheses have more explanatory power? To what degree do different IGOs deal with the same climate security challenges, yielding potential for cross-community learning processes and integrating governance responses? Under what conditions can barriers to integrated governance such as different definitions of vulnerabilities and temporal scales used in different policy areas be overcome? What impact do nonstate actors such as civil society organizations and companies have on the development of integrated governance? Such a research agenda would not only contribute new knowledge to the emerging field of research on IGOs and climate security. It could also explicitly reflect on how different theoretical perspectives can be used to explain integrated governance in climate security, with the prospect of fostering cross-fertilization across rationalist and constructivist research traditions in the study of institutional change.^{95,97}

Explaining Output, Outcomes, and Impact: Conditions for Effective IGO Responses

How well have IGOs fared in responding to climate security challenges? Existing works have broken new ground by demonstrating how integrated governance approaches have shaped various UN agencies' responses to climate security challenges in the past. What we need is a major step forward in our understanding of how to structure IGOs and design policies to maximize IGOs' effectiveness.

To add knowledge on the conditions of effective IGO responses, scholars need to develop measurable conceptualizations of effectiveness, and theorize what explains variation in these aspects of effectiveness. Concepts could be adopted from research on the effectiveness of global environmental regimes⁹⁸ and IGOs.⁹⁹ Regimes refer to rules, norms, procedures, and ideational structures influencing global outcomes. Although the regime literature does not focus on IGOs as actors,¹⁰⁰ it has generated useful insights for the study of IGO effectiveness, with the notion of 'regime' being largely replaced with 'institutions' in recent IR research (Ref 11, p. 328). More specifically, there are three dimensions of effectiveness: a regime's production of norms (output), behavioral effects (outcome), and ultimate effectiveness with regard to its subject matter (impact).¹⁰¹ Recent research on IGOs has further refined this threefold definition, developing a more nuanced understanding of IGO output,¹⁰² which is closely related to IGO performance, that is, the degree of correspondence between output and the problems facing an IGO (Ref 99, p. 1090).

Existing conceptual debates on effectiveness have implications for measurement—a recognized challenge in the literature on effectiveness in global governance. In this respect, IGO performance may be best suited for a comparison of the performance of IGOs in addressing climate security challenges, as it may be evaluated through comparisons of accomplishments within and across organizations.⁹⁹ A focus on IGO performance would allow for systematic inquiry into the conditions for effectiveness across IGOs—for example, in terms of response speed, integrated governance, and the ambitiousness of responses given the policy problem at hand.

By contrast, measuring effectiveness in terms of behavioral change may be more challenging, as successful implementation may be difficult to compare across IGOs and policy areas.⁹⁸ Yet questions pertaining to behavior change, for example, among states or societal actors, induced by IGO responses to climate security challenges, are of paramount importance. Focusing on behavioral change would enable

researchers to assess the conditions under which global and domestic actors adjust to and comply with new governance approaches and policies on climate security matters. On the impact dimension, scholars could address questions about whether the security of vulnerable people or states indeed improves as a result of IGO responses. Yet it may be challenging to establish causal links between IGOs and impact because of the presence of interfering variables between an IGO's policy and outcomes, particularly in policy areas characterized by complexity and scientific uncertainty.

In terms of theory development, the effectiveness literature suggests several explanatory factors of IGO performance, pertaining to power and interest constellations, organizational cultures, institutional design, and organizational culture.^{99,102} Central drivers identified in the literature on behavior change and impact of global environmental regimes include problem structure, compliance, global power constellations, the legitimacy and perceived fairness of institutions, and the support of domestic corporate and civil society actors for global rules.^{98,100,103} Future studies might usefully explore the relative power of such factors in explaining effective IGO responses to climate security challenges, contributing to the emerging field identified in this article and broader literatures on climate security and institutional effectiveness in IR and environmental social science.

Scope of Research

Accumulation of knowledge about (effective) IGO responses to climate security challenges also depends on research having a broad scope, including multiple IGOs and policy areas. Broad-based research designs allow for a closer examination of the many contingencies of (effective) IGO responses.

Which research strategies are most promising? There are good reasons to continue to nurture theory-driven inductive or deductive single-case studies. They are well equipped to enhance context-specific knowledge and to uncover causal mechanisms, which are important aims given that the field is at an early stage. Yet single-case studies impose limits on producing generalizable results.¹⁰⁴ By contrast, qualitative or quantitative comparative approaches typically fall short of thick descriptions of specific cases, but are better suited to adjudicate among rival explanations, allowing researchers to systematically vary the conditions under which institutional change and effectiveness in global climate security governance might occur. In addition, comparative small- or large-*N* research can shed light on complex causality, where complex combinations of

factors determine institutional change or effectiveness.⁹⁸ Given these complementary advantages, the IR literatures on institutional change and effectiveness have emphasized that mixed-methods research has proven particularly useful.^{98,99}

More specifically, comparative research would enable the systematic study of IGO responses to climate security challenges across several dimensions of variation, that is, variation across space, scales, and over time. In terms of spatial variation, it would reward future studies to examine how IGO responses, performance, or effectiveness vary across policy areas, and which factors have explanatory leverage across policy areas. Aspects of institutions and effectiveness could be compared either across bodies of the same IGOs or across IGOs. For example, we need to know more about framings and understandings of climate security challenges in different policy areas, at least partially affecting whether actors are willing to bear the transaction costs of institutional change, potentially impeding or promoting integrated governance arrangements.

Moreover, IGO responses and their effectiveness could be investigated across scales. Researchers could inquire about IGO effectiveness by comparing the influence of IGO discourse or governance on behavior change, compliance, and outcomes such as peace and conflict at national and sub-national levels. Alternatively, examining how country conditions impact state interests in global climate security governance could help understand the conditions for institutional change at the global level. Moreover, we need to know more about whether factors determining institutional effectiveness at the domestic level travel to the global level.^{98,105}

Third, temporal factors may shape institutional change and effectiveness. In this respect, the degree of institutionalization of governance arrangements over time, or specific events such as natural disasters, might be relevant factors to explore in the search for determinants of (the effectiveness of) IGO responses to climate security challenges.

CONCLUSIONS

As IGOs have been delegated growing political authority, questions about their responses to climate security challenges have become increasingly important. Given their transboundary nature, meeting climate security challenges with national and local government alone would be suboptimal and invite uncoordinated climate policies that may compromise both state and human security. IGOs are therefore essential for realizing and preserving state and human security in today's more global world.

Scholarly research on IGOs and climate security constitutes a very young research field. Yet it has already significantly enhanced our understanding of how and why IGOs respond to climate security challenges, particularly in the context of IGOs with a mandate in state security. Despite different epistemological and theoretical approaches, existing studies share common themes pertaining to the adverse effects of climate change, mitigation, and adaptation efforts, high-impact climate scenarios, and risk-based approaches to decision making.

Despite significant advances, much opportunity for further accumulating knowledge about the conditions under which IGOs address climate security challenges, and when they do so effectively, remains. The way forward is to diversify existing theoretical and methodological research strategies. Theoretically, we expect existing theories of institutional change and effectiveness in IR to offer explanatory leverage. Methodologically, we advocate thinking conditionally about institutional change and effectiveness, complementing existing inductive case study research with theory-driven comparative research. When findings converge, we gain more general insight about the conditions for institutional change and effectiveness in global climate security governance. A better understanding of these issues could facilitate the design of effective global solutions to society's most intractable climate security challenges.

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FURTHER READINGS

European Commission. *Climate Change and International Security. Paper from the High Representative and the European Commission to the European Council. S113/08*. Brussels: European Communities; 2008.

European Union. A Global Strategy for the European Union's Foreign and Security Policy. June 2016.

Mobjörk M, Gustafsson M-T, Sonnsjö H, van Baalen S, Dellmuth LM, Bremberg N. *Climate-Related Security Risks: Towards an Integrated Approach*. SIPRI and Stockholm University; October 2016.

United Nations. United Nations General Assembly, Climate Change and its Possible Security Implications, A/RES/63/281, June 11, 2009.

United Nations Development Programme. *Human Development Report 1994: New Dimensions of Human Security*. New York: United Nations Development Programme; 1994.

REFERENCES

1. McMichael AJ. Insights from past millennia into climatic impacts on human health and survival. *Proc Natl Acad Sci U S A* 2011, 109:4730–4737.
2. Scheffran J, Brzoska M, Kominek J, Link PM, Schilling J. Disentangling the climate-conflict nexus: empirical and theoretical assessment of vulnerabilities and pathways. *Rev Eur Stud* 2012, 4:1–13.
3. Seter H. Connecting climate variability and conflict: implications for empirical testing. *Polit Geogr* 2016, 53:1–9.
4. Gleditsch NP. Whither the weather? Climate change and conflict. *J Peace Res* 2012, 49:3–9.
5. Buhaug H. Climate-conflict research: some reflections on the way forward. *WIREs Clim Change* 2015, 6:269–275.
6. Detges A. *Climate and Conflict: Reviewing the Statistical Evidence*. Berlin, Germany: Federal Foreign Office and Adelphi; 2017.
7. Adger WN, Pulhin JM. Human security. In: Field CB et al., eds. *Climate Change 2014: Impacts, Adaptation, and Vulnerability. Part A: Global and Sectoral Aspects. Contribution of Working Group II to the Fifth Assessment Report of the Intergovernmental Panel on Climate Change*. Cambridge, UK: Cambridge University Press; 2014, 755–791.
8. Gemenne F, Barnett J, Adger WN, Dabelko GD. Climate and security: evidence, emerging risks and a new agenda. *Clim Change* 2014, 123:1–9.
9. Rüttinger L, Smith D, Stang G, Tänzler D, Vivekananda J. *A New Climate for Peace: Taking Action on Climate and Fragility Risks*. Berlin, Germany: Adelphi and International Alert; 2015.
10. Barnett J, Matthew RA, O'Brien KL. Global environmental change and human security: an introduction. In: Matthew RM, Barnett J, McDonald B, O'Brien KL, eds. *Global Environmental Change and Human Security*. Cambridge, MA: MIT Press; 2010, 3–32.
11. Martin LL, Simmons BA. International organizations and institutions. In: Carlsnaes W, Risse T, Simmons BA, eds. *Handbook of International Relations*. London, UK: Sage; 2012, 326–352.
12. The North Atlantic Treaty Organization (NATO). Environment – NATO's stake 2014. Available at: http://nato.int/cps/en/natohq/topics_91048.htm. (Accessed July 24, 2016).
13. United Nations Environment Programme (UNEP). *Understanding Environment, Conflict, and Cooperation*. Nairobi, Kenya: United Nations Environmental Programme; 2004.
14. United Nations Development Programme (UNDP). *Human Development Report 2007/2008: Fighting Climate Change: Human Solidarity in a Divided World*. New York, NY: Palgrave Macmillan, 2007.
15. United Nations General Assembly (UNGA). Climate change and its possible security implications. Report of the Secretary-General A/64/350, September 11, 2009.
16. United Nations Security Council. Statement by the President of the Security Council. S/PRST/2011/15. 2011. Available at: https://www.ecc-platform.org/images/CCIS/UNSC_Presidential_Statement.pdf. (Accessed July 24, 2016).
17. Schubert R, Schellnhuber HJ, Buchmann N, Griesshammer R, Kulesa M, Messner D, Rahmstorf S, Schmid J. *Climate Change as a Security Risk. German Advisory Council on Global Change (WBGU)*. London, UK: Earthscan; 2008.
18. King D, Schrag D, Dadi Z, Ye Q, Ghosh A. *Climate Change: A Risk Assessment. Centre for Science and Policy*. Cambridge, UK: Cambridge University; 2015.
19. Peters K, Vivekananda J. *Topic Guide: Conflict, Climate and the Environment*. London, UK: International Alert; 2014.
20. Schwartz P, Randall D. *An Abrupt Climate Change Scenario and Its Implications for United States National Security*. Washington, DC: Environmental Media Services; 2003.
21. Mobjörk M, Gustafsson MT, Sonnsjö H, van Baalen S, Dellmuth LM, Bremberg N. *Climate-Related*

- Security Risks: Towards an Integrated Approach*. Stockholm, Sweden: Stockholm International Peace Research Institute, Stockholm University, & The Swedish Institute of International Affairs; 2016.
22. Vivekananda J, Janpeter S, Smith D. Climate resilience in fragile and conflict-affected societies: concepts and approaches. *Dev Pract* 2014, 24:487–501.
 23. Hayvaert V. Governing climate change: towards a new paradigm for risk regulation. *Mod Law Rev* 2011, 74:817–844.
 24. Adger NW. Climate change, human well-being and insecurity. *New Polit Econ* 2010, 15:275–292.
 25. Dalby S. *Security and Environmental Change*. Cambridge, UK: Polity Press; 2009.
 26. Barnett J, Adger WN. Climate change, human security and violent conflict. *Polit Geogr* 2007, 26:639–655.
 27. Matthew R, Barnett J, McDonald B, O'Brien K. *Global Environmental Change and Human Security*. Cambridge, MA: MIT Press; 2010.
 28. O'Brien K, St. Clair AL, Kristoffersen B. *Climate Change, Ethics, and Human Security*. Cambridge, UK: Cambridge University Press; 2010.
 29. Oels A. Rendering climate change governable by risk: from probability to contingency. *Geoforum* 2013, 45:17–29.
 30. Trombetta MJ. Environmental security and climate change: analysing the discourse. In: Harris PG, ed. *The Politics of Climate Change: Environmental Dynamics in International Affairs*. New York: Routledge; 2009, 129–146.
 31. Baldwin D. The concept of security. *Rev Int Stud* 1997, 23:5–26.
 32. Buzan B. *People, States and Fear: The National Security Problem in International Relations*. Brighton, UK: ECPR Press; 1983.
 33. Douglas M, Wildavsky A. *Risk and Culture: An Essay on the Selection of Technological and Environmental Dangers*. Berkeley, CA: University of California Press; 1983.
 34. Buzan B, Waever O, de Wilde J. *Security: A New Framework for Analysis*. London, UK: Lynne Rienner Publishers; 1998.
 35. Huysmans J. Security! What do you mean? From concept to thick signifier. *Eur J Int Rel* 1998, 4:226–256.
 36. Floyd R. Global climate security governance: a case of institutional and ideational fragmentation. *Confl Secur Dev* 2015, 15:119–146.
 37. Trombetta M. Linking climate-induced migration and security within the EU: insights from the securitization debate. *Crit Stud Secur* 2014, 2:131–147.
 38. Hartmann B. Rethinking climate refugees and climate conflict: rhetoric, reality and the politics of policy discourse. *J Int Dev* 2010, 22:233–246.
 39. United Nations Development Programme. *Fighting Climate Change: Human Solidarity in a Divided World*. London, UK: Palgrave Macmillan; 2007.
 40. Detraz N, Bestill M. Climate change and environmental security: for whom the discourse shifts. *Int Stud Perspect* 2009, 10:303–320.
 41. Brauch HG. Securitizing global environmental change. In: Brauch HG, Behara NC, Kameri-Mbote P, Grin J, Oswald Spring Ú, Chourou B, Mesjasz C, Krummenacher H, eds. *Facing Global Environmental Change: Environmental, Human, Energy, Food, Health and Water Security Concepts*. Berlin, Germany: Springer; 2009, 65–102.
 42. McDonald M. Discourses of climate security. *Polit Geogr* 2013, 33:42–51.
 43. Oels A. From 'Securitization' of climate change to 'climatization' of the security field: Comparing three theoretical perspectives. In: Scheffran J, Brzoska M, Brauch HG, Link PM, Schilling J, eds. *Climate Change, Human Security and Violent Conflict*. Berlin, Germany: Springer; 2012, 185–205.
 44. Mason M. Climate insecurity in (post)conflict areas: the biopolitics of United Nations vulnerability assessments. *Geopolitics* 2014, 19:806–828.
 45. Baldwin A, Methmann C, Rothe D. Securitizing 'climate refugees': the futurology of climate-induced migration. *Crit Stud Secur* 2014, 2:121–130.
 46. Brzoska M. The securitization of climate change and the power of conceptions of security. *Secur Peace* 2009, 27:137–208.
 47. Sergunin A. The debate on ecological security in Russia, Belarus and Ukraine. In: Brauch HG, Oswald Spring Ú, Grin J, Mesjasz C, Kameri-Mbote P, Chadha Behera N, Chourou B, Krummenacher H, eds. *Facing Global Environmental Change. Environmental, Human, Energy, Food, Health and Water Security Concepts*. Berlin, Germany: Springer; 2009, 803–816.
 48. Nicol HN, Heininen L. Human security, the Arctic Council and climate change: competition or co-existence? *Polar Rec* 2014, 50:80–85.
 49. Cousins A. UN Security Council: playing a role in the international climate change regime? *Global Change Peace Secur* 2013, 25:191–201.
 50. Scott SV. The securitization of climate change in world politics: how close have we come and would full securitization enhance the efficacy of global climate change policy? *Rev Eur Community Int Environ Law* 2012, 21:220–230.
 51. Sindico F. Climate change: a security Council issue? *Carbon Clim Law Rev* 2007, 1:6–11.
 52. Conca K. *An Unfinished Foundation: The United Nations and Global Environmental Governance*. New York: Oxford University Press; 2015.
 53. Scott SV. Securitizing climate change: international legal implications and obstacles. In: Harris PG, ed. *The*

- Politics of Climate Change: Environmental Dynamics in International Affairs*. New York: Routledge; 2009, 147–163.
54. Methmann C, Rothe D. Politics for the day after tomorrow: the logic of apocalypse in global climate politics. *Secur Dialogue* 2012, 43:323–344.
 55. Scott SV. Implications of climate change for the UN Security Council: mapping the range of potential policy responses. *Int Aff* 2015, 91:1317–1333.
 56. Vogler J. Changing conceptions of climate and energy security in Europe. *Environ Polit* 2013, 22:627–645.
 57. Youngs R. *Climate Change and European Security*. New York: Routledge; 2015.
 58. van Schaik L, Schunz S. Explaining EU activism and impact in global climate politics: is the union a norm- or interest-driven actor? *J Common Mark Stud* 2012, 50:169–186.
 59. Geddes A. Governing migration from a distance: interactions between climate, migration, and security in the South Mediterranean. *Eur Secur* 2015, 24:473–490.
 60. Zwolski K, Kaunert C. The EU and climate security: a case of successful norm entrepreneurship? *Eur Secur* 2011, 20:21–43.
 61. Youngs R. *Energy security: Europe's New Foreign Policy Challenge*. New York: Routledge; 2009.
 62. Strambo C, Nilsson M, Månsson A. Coherent or inconsistent? Assessing energy security and climate policy interaction within the European Union. *Energy Res Soc Sci* 2015, 8:1–12.
 63. Umbach F. The intersection of climate protection policies and energy security. *JTS* 2012, 10:374–387.
 64. Hall N. *Displacement, Development, and Climate Change*. London, UK: Routledge; 2016.
 65. Barnett J. *The Meaning of Environmental Security: Ecological Politics and Policy in the New Security Era*. London, UK: Zed books; 2001.
 66. Detraz N. Threats or vulnerabilities? Assessing the link between climate change and security. *Global Environ Polit* 2011, 11:104–120.
 67. Schmidt V. Discursive institutionalism: the explanatory power of ideas and discourse. *Annu Rev Polit Sci* 2008, 11:303–326.
 68. Sørensen E, Torfing J. *Theories of Democratic Network Governance*. London, UK: Palgrave Macmillan; 2007.
 69. Hall N. Money or mandate? Why international organisations engage with the climate change regime. *Global Environ Polit* 2015, 2:87–88.
 70. Miles LM, Underdal A, Andresen S, Wettestad J, Skjærseth JB, Carlin EM. *Environmental Regime Effectiveness: Confronting Theory with Evidence*. Cambridge, MA: MIT Press; 2002.
 71. Biersteker TJ. Global security governance. In: Dunn Cavelti M, Thierry B, eds. *Routledge Handbook of Security Studies*. New York: Routledge; 2017, 425–435.
 72. Liberatore A. Climate change, security and peace: the role of the European Union. *Rev Eur Stud* 2013, 5:83–94.
 73. De Jong S, Schunz S. Coherence in European Union external policy before and after the Lisbon Treaty: the cases of energy security and climate change. *Eur Foreign Aff Rev* 2012, 17:165–187.
 74. Knight A. Global environmental threats: can the Security Council protect our earth? *N Y Univ Law Rev* 2005, 80:1549–1585.
 75. Conway D. The United Nations Security Council and climate change: challenges and opportunities. *Clim Law* 2010, 1:375–407.
 76. Depledge D, Feakin T. Climate change and international institutions: implications for security. *Clim Policy* 2012, 12:S73–S84.
 77. Martin S. Environmental change and migration: legal and political frameworks. *Environ Plan C Gov Policy* 2012, 30:1045–1060.
 78. Hardt JN. *Environmental Security in the Anthropocene: Assessing Theory and Practice*. Abingdon: Routledge; 2018.
 79. McAdam J. Swimming against the tide: why a climate change displacement treaty is not the answer. *Int J Refug Law* 2011, 23:2–27.
 80. McAdam J. Environmental migration. In: Betts A, ed. *Global Migration Governance*. Oxford, UK: Oxford University Press; 2011, 153–188.
 81. Biermann F, Boas I. Preparing for a warmer world: towards a global governance system to protect climate refugees. *Global Environ Polit* 2010, 10:60–88.
 82. Bauer S. Stormy weather: international security in the shadow of climate change. In: Brauch HG, Oswald Spring Ú, Mesjasz C, Grin J, Kameri-Mbote P, Chourou B, Dunay P, Birkmann J, eds. *Coping with Global Environmental Change, Disasters and Security*. Berlin, Germany: Springer; 2011, 719–733.
 83. Kelman I. Climate change and the Sendai framework for disaster risk reduction. *Int J Disaster Risk Sci* 2015, 6:117–127.
 84. Matthew R. Integrating climate change into peacebuilding. *Clim Change* 2014, 123:83–93.
 85. Birkmann J, von Teichman K. Integrating disaster risk reduction and climate change adaptation: key challenges – scales, knowledge, and norms. *Sustainab Sci* 2010, 5:171–184.
 86. Schipper ELF, Pelling M. Disaster risk, climate change and international development: scope for, and challenges to, integration. *Disasters* 2006, 30:19–38.
 87. Schipper ELF, Thomalla F, Vulturius G, Davis M, Johnson K. Linking disaster risk reduction, climate change and development. *Int J Disaster Resil Built Environ* 2016, 7:216–228.

88. McBean GA. Coping with global environmental change: need for an interdisciplinary and integrated approach. In: Brauch HG, ed. *Coping with Global Environmental Change, Disasters and Security*. Berlin, Germany: Springer; 2011, 1193–1204.
89. Tänzler D, Ries F. International climate change policies: the potential relevance of REDD+ for peace and stability. In: Scheffran J, Brzoska M, Brauch HG, Link PM, Schilling J, eds. *Climate Change, Human Security and Violent Conflict – Challenges for Societal Stability*. Berlin, Germany: Springer; 2012, 695–705.
90. Oberthür S, Gehring T, eds. *Institutional Interaction in Global Environmental Governance: Synergy and Conflict among International and EU Policies*. Cambridge, MA: MIT Press; 2006.
91. Keohane RO. *After Hegemony: Cooperation and Discord in the World Political Economy*. Princeton University Press: Princeton, NJ; 2005.
92. Scharpf FW. *Games Real Actors Play: Actor-centered Institutionalism in Policy Research*. New York: Westview Press; 1997.
93. Snidal D. Rational choice and international relations. In: Carlsnaes W, Risse T, Simmons BA, eds. *Handbook of International Relations*. New York: Sage; 2012, 85–111.
94. Finnemore M, Sikkink K. International norm dynamics and political change. *Int Org* 1998, 52:887–917.
95. Risse T, Sikkink K. The socialization of international human rights norms into domestic practices: introduction. In: Risse T, Ropp S, Sikkink K, eds. *The Power of Human Rights - International Norms and Domestic Change*. Cambridge, UK: Cambridge University Press; 1999, 1–38.
96. Adler E. Constructivists in international relations: Sources, contributions and debates. In: Carlsnaes W, Risse T, Simmons B, eds. *Handbook of International Relations*. Thousand Oaks, CA: Sage; 2012, 112–144.
97. Sil R, Katzenstein PJ. Analytic eclecticism in the study of world politics: reconfiguring problems and mechanisms across research traditions. *Perspect Polit* 2010, 8:411–431.
98. Young OR. Effectiveness of international environmental regimes: existing knowledge, cutting-edge themes, and research strategies. *Proc Natl Acad Sci USA* 2011, 108:19853–19860.
99. Tallberg J, Sommerer T, Squatrito T, Lundgren M. The performance of international organizations: a policy output approach. *J Eur Publ Policy* 2016, 23:1077–1096.
100. Young OR. *Governance in World Affairs*. Ithaca, NY: Cornell University Press; 1999.
101. Oberthür S, Gehring T. Conceptual foundations and institutional interaction. In: Oberthür S, Gehring T, eds. *Institutional Interaction in Global Environmental Governance: Synergy and Conflict among International and EU Policies*. Cambridge, MA: MIT Press; 2006, 19–52.
102. Gutner T, Thompson A. The politics of IO performance: a framework. *Rev Int Org* 2010, 5:227–248.
103. Krasner SD, ed. *International Regimes*. Ithaca, NY: Cornell University Press; 1983.
104. Young OR, ed. *The Effectiveness of International Environmental Regimes: Causal Connections and Behavioral Mechanisms*. Cambridge, MA: MIT Press; 1999.
105. Bernauer T, Siegfried T. Compliance and performance in international water agreements: the case of the Naryn/Syr Darya Basin. *Global Gov* 2008, 14:479–501.