



Governance in the water-energy-food nexus: Gaps and future research needs

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**GOVERNANCE IN THE WATER-ENERGY-FOOD NEXUS:
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1 INTRODUCTION

Rapid global change is increasing the demand for water, energy, food, and other resources, while short-term, sector-focused resource management poses risks to the sustainability of both ecosystems and societies (Pittock et al. 2013). One response, which has gained the attention of policy-makers and researchers, is to frame analysis and policy using the concept of a “water-energy-food nexus” (from here onward, nexus). The nexus concept has proved sufficiently compelling for nexus frameworks to proliferate (Leck et al. 2015), while a growing set of analytical tools supports nexus analysis by quantifying allocations, and resource availability and requirements (see e.g. Granit et al. 2013).

Nexus frameworks and tools have proved useful for such purposes, but analytical insight does not, by itself, lead to effective and accountable policymaking and management. The governance landscape and the processes, norms, rules and interests that dictate how resources are allocated critically influence how technical information on trade-offs between sectoral objectives is translated into action (Cairney 2016). A generally agreed principle is that sustainable development requires distinct environmental, social and economic policies combined with more integrated decision-making across all sectors of society (Nilsson et al. 2009). However, these conditions are rarely observed and present a paramount challenge, which is addressed in the academic literature under various concepts of integrative environmental governance (Jordan and Lenschow 2010; Adelle and Russel 2013; Visseren-Hamakers 2015).

The challenge of achieving such integrated decision-making and policy coherence is particularly acute in the context of the nexus, which considers three sectors and policy areas with different institutional frameworks operating at different scales (e.g. Batterbury and Fernando 2006; Scott et al. 2011). For example, while the energy sector is in many places market-based, run by large scale companies and operating in global and national markets, the water sector is typically dominated by small public utilities and operates within regulated markets at the local or municipal level (SIWI 2014). Food production is carried out by farmers and companies acting at all different scales.

While the nexus concept necessarily brings with it complex governance challenges, and nexus proponents emphasize the need for integrated governance and policy coherence, the treatment of governance in the nexus literature is superficial (Leck et al. 2015). This means that governance interventions based on a nexus approach are limited to either technical-administrative analysis for optimal allocation of resources or educating decision-makers about nexus interactions so they can make better-informed decisions. The richer and deeper facets of governance theory, its politics, norms and power relations, are to a large extent lacking. This disconnects the nexus approach from the decision-making and policymaking processes that it ultimately seeks to influence.

This paper explores how the nexus literature addresses governance. It identifies critical gaps that need to be filled by future research. Through an informed, but not exhaustive, review of the nexus literature, the paper identifies three issues that are not addressed: (i) *the conditions under which cross-sector coordination and collaboration come about*; (ii) *the dynamics beyond cross-sector interactions that influence decision-making and policymaking in the nexus*; and (iii) *the role of political and cognitive factors as determinants of change in the nexus*.

The paper highlights future research needs, encouraging the nexus community to connect with the wealth of theoretical and conceptual perspectives in the governance community. More specifically, it proposes exploring how the literature on integrative environmental governance could help fill these gaps.

1.1 Methodology

To capture the essence of the nexus discourse on governance we searched for academic articles using the EBSCO Discovery Service (EDS) using the keywords “Nexus”, “Water-Energy-Food Nexus” and (“Nexus” + “governance”). For grey literature such as working papers or conference proceedings we used Google and Google Scholar. With the objective of capturing the essence of the nexus discourse on governance, rather than providing a comprehensive or systematic review of the nexus literature, we included 26 references, approximately half of which are peer-reviewed papers, all published after the Bonn Nexus conference in 2011. These references (indicated with an asterisk in the reference list) were reviewed for governance implications (whether a role was ascribed to governance, or the governance issues implied by a nexus approach) with the objective of identifying key gaps.

The nexus literature is sprawling and lacks conceptual clarity and precision (Leck et al. 2015). Nor is there a shared definition of the nexus or its underlying principles. An outstanding methodological question that presents itself as a result of the conceptual imprecision of the nexus concept is how to set the boundaries of analysis; that is, how to determine what issues qualify as nexus issues and which processes are of relevance in addressing them. Our take is that these boundaries need to be decided on a case-by-case basis among relevant stakeholders. In our review of the literature we have therefore only included papers that self-identify as nexus literature.

To handle the conceptual imprecision and encompass the many views, arguments and perceptions of the nexus in the literature, we identified three broad perspectives within it, which we call risk, economic rationality, and political economy. The risk perspective focuses on identifying and managing risks across (transnational) supply chains and avoiding the emergence or escalation of conflicts resulting from acute or sudden resource scarcity. The economic rationality perspective focuses on optimizing the allocation of resources across sectors from a cost-effectiveness point of view. The political economy perspective emphasizes how the allocation of resources among actors, rather than sectors, can be made more equitable.

Any classification of a complex policy issue has limitations, and the three perspectives are neither mutually exclusive nor exhaustive. However, we found them to be useful for structuring our review and to guide the identification of gaps in the nexus literature in a way that respects the concept’s diversity.¹

Finally, in this paper we have not explicitly called on the governance literature to identify and elaborate the governance gaps, but consulted it in an iterative fashion. Having identified the gaps, the next step in the research is to explore in-depth which strands of governance literature can help to elaborate and fill them.

1.2 Key concepts

Water-energy-food nexus

Research on cross-sector and cross-scale interactions is not new. It is at the core of sustainable development research, and “nexus thinking” is everyday practice for many. In the late 2000s, attention on these interactions began to be framed as the water-energy-food nexus. Previously dominant approaches, such as integrated water management (IWRM), were seen as too narrow and inadequate to respond to emerging global economic and food crises. In response, the nexus was promoted at numerous international conferences and workshops, and in the grey literature (for an overview, see e.g. Leck et al. 2015).

¹ In a journal article (Weitz et al. forthcoming) we pick up on the gaps identified in this working paper and explore in-depth how the literature on integrative environmental governance (IEG) can help fill them. This working paper is thus a first step in addressing governance gaps in the nexus literature and the challenge of achieving integrated decision-making and policy coherence across the water, energy, and food sectors.

In the academic sphere the research agenda on the nexus has largely focused on conceptual issues and establishing whether it does indeed add value (Mayor et al. 2015). Hoff (2011) concludes that the nexus approach gives new impetus to the implementation of a systemic approach to improving policy coherence, and developing synergies and negotiating trade-offs between sectors. Benson, Gain, and Rouillard (2015) suggest that the nexus is more holistic than the water-centric IWRM in its integration of different policy sectors, and that it both encourages business involvement and promotes economically rational decision-making (Benson et al. 2015). Others (such as FAO 2014) claim novelty in that the nexus does not prioritize one sector over the other.

Although there is no single agreed definition of the nexus (Benson et al. 2015), the different perspectives all emphasize policy coherence, integrated and coordinated decision-making, as well as management, planning and governance across sectors and scales. For example, the Bonn Conference Background Report, a landmark report on the nexus approach, defines the approach as one that “highlight[s] the interdependence of water, energy and food security and the natural resources that underpin that security – water, soil and land”, and that “integrates management and governance across sectors and scales...”. By better specifying these interdependencies, a nexus approach “identifies mutually beneficial responses and provides an informed and transparent framework for determining trade-offs and synergies that meet demand without compromising sustainability” (Hoff 2011, pp. 13, 7). Furthermore, Hoff (2011) pins down guiding principles based on the pillars of sustainable development: investing to sustain ecosystem services; creating more with less; and accelerating access to resources for the poorest and integrating the poor into development.

Importantly, and despite the conceptual imprecision, formal nexus thinking has captured the attention of various levels of governance, across socio-economic sectors, and within different institutions. This presents an opportunity to improve coherence and better align management and decision-making across the food production, water, and energy systems. The value of the nexus approach may thus lie not in how it conceptualizes interactions, but in the attention it draws to the connections between a variety of environmental and social objectives. A focus on such connections is important for better governance to promote resource efficiency, sustainability and human development.

Governance

The concept of governance emerged in the academic discourse in the early 1990s in recognition of the fact that the state is not the sole entity steering society (Pierre and Peters 2005). Governance recognizes the complexity of decision-making and focuses on institutions that are interdependent both vertically and horizontally. It challenges the idea that governing is organized in hierarchical command structures and tight clusters of institutions – the “silos” often referred to by proponents of integrated governance (Jordan and Lenschow 2010).

Given the shared nature of environmental resources and the interdependence among those who rely on them, the need for collective decision-making is generally agreed on within environmental governance (Peters and Pierre 1998). Furthermore, because environmental governance encompasses international relations, political science, public administration and development studies, it is perhaps the most multidisciplinary and applied field of governance theory. It recognizes global processes as well as global-local relationships; the importance and limitations of states as the key actors and of the increase in new actors; the institutional capacity of states, markets and communities to cope with collective action problems; and the challenges of the many distinct interests across different geographies and socio-economic settings (Chhotray and Stoker 2008). As Batteredbury and Fernando (2006: 1857) have put it, resource degradation shares a mutual relationship with political and social change and therefore explanations for these changes must be sought at “multiple scales, and across the human and non-human world; from the international economy

down to the systems of rules governing local access”. Different strands of the governance literature have explored these relationships and explanatory factors among organizations, institutions, policies, and different levels of governance.

2 THE VIEW ON GOVERNANCE IN THE NEXUS LITERATURE

Despite conceptual differences, the nexus literature is broadly clear on the governance problem that it sets out to address, which is that fragmented policies lead to unintended consequences. So, policy coherence emerges as the desired overarching outcome of implementing a nexus approach. Nexus authors do not, however, agree on why fragmented policies pose problems or how they can be overcome. Nor does the literature elaborate on what exactly policy coherence entails. Below we summarize perceptions and arguments from the three perspectives on the nexus outlined in section 1.1: risk, economic rationality, and political economy.

2.1 Three perspectives on the nexus: governance implications

A risk perspective

The prevailing idea under the risk perspective is that failing to account for connections between nexus sectors could render “resource allocation a zero-sum game where intense competition for resource access can easily become conflict” (Bizikova et al. 2013: 5). The literature raises expectations that the nexus approach will reduce such risks of resource scarcity and conflict. From this perspective, there is a strong focus on resource flows and resource use, the factors that increase demand for water, energy, and food resources – and how this affects the availability of resources for the respective sectors (see e.g. Kumar et al. 2014; Bazilian et al. 2011). Coherence and the integration of sectors are seen as necessary because decisions that enhance security in one sector may compromise security in others (Gain et al. 2015). For example, first-generation biofuel production can pose risks to food security (Rulli et al. 2016).

The impacts of climate change on resource availability are frequently discussed in nexus studies. Rasul and Sharma (2015), for example, argue that by improving the efficiency of resource use and contributing to policy coherence a nexus approach could support climate change adaptation and food, water, and energy security. The World Economic Forum (2011) also argues that without a policy framework that effectively addresses the risks that arise from the effects of climate change on the water, energy, and food sectors, a scramble for resources could lead to a retreat from globalization. In a similar way, in 2013 the US National Intelligence Council listed the water-energy-food nexus as one of four geopolitical megatrends for 2030, stating that global demand for these resources will grow substantially, and that tackling problems related to one of them will be linked to the supply and demand for the other two. Royal Dutch Shell also identifies risks to the security of its operations in nexus terms (Shell International BV 2013). Beisheim (2013) identifies the main barriers to reducing nexus-related risks. These include the mismatch between how institutions are organized and the ways in which nexus problems materialize; lack of strategic clarity among institutions; and slowness to adopt the nexus concept and related assessments and tools in institutions and policy.

The literature recommends various strategies for reducing nexus-related security risks, such as placing supply risks on the political agenda and improving data collection in order to clarify interactions and design incentives (Beisheim 2013, World Economic Forum 2011, Gain et al. 2015). The World Economic Forum further recommends improving the links between technical investigations, economic analysis and policy design to better understand and address supply risks while supporting consensus building through multi-stakeholder platforms. All of the measures referred to in the US National Intelligence Council report seek to isolate sectors from the impacts generated by the other sectors, for instance through food subsidies, buying farmland overseas or modifying

the energy mix. Among other things, Beisheim (2013) suggests that the scope of nexus thinking should be broadened beyond the water, energy, and food sectors to consider so-called planetary boundaries – the “safe operating space” for humanity (Rockström et al. 2009). This would extend the type and scale of risks considered and could, for example, mean integrating climate adaptation and disaster risk reduction into nexus analysis, or relying on the precautionary principle.

An economic rationality perspective

Arguments guided by economic rationality are often made in the nexus literature. For example, conclusions from the 2014 World Water Week in Stockholm, which focused on the nexus, expressed the expectation that using a nexus framing to guide planning would deliver more cost-effective policies, improve resource-use efficiency, and allow resources to be allocated optimally across fragmented sectors (SIWI 2014). This is to be achieved by identifying trade-offs and synergies across sectoral objectives and different institutional frameworks, and improving coherence in implementation and management (Bonn Nexus Conference Policy Recommendations 2011: 5). A recurrent idea from this perspective is that a nexus approach can help to “optimize” how water, energy, and land resources are allocated. This implies that a balance can be struck in resource allocation, in which demands, rather than being contradictory, can all be met at the same time. The World Business Council for Sustainable Development (WBCSD 2014), for example, suggests that using the nexus to guide agricultural policy would allow increased production, reduce pressures on water and land, and boost energy efficiency in agriculture. Some authors expect the nexus to yield new business opportunities and (green) economic growth (e.g. Vlotman and Ballard 2014; World Economic Forum 2011). Supply chains feature in this framing, and some authors and companies consider the nexus approach to be a promising route to ensuring sustainable water resource use in energy and food supply chains (Zahner 2014; Wales 2014).

The barriers identified to achieving the desired objectives are similar to those identified from the risk perspective, such as the mismatch between how institutions are organized and the ways in which nexus problems materialize (Hack 2015). Pittock, Hussey, and McGlennon (2013) emphasize the sectors’ different institutional frameworks and diverging targets, lack of communication, and lack of clarity on rights and responsibilities across sectors. Among the options proposed to overcome the barriers are: cross-sectoral cooperation; increased communication; inclusive demand management; dialogue platforms or other interagency mechanisms; and economic instruments (SIWI 2014; Ringler et al. 2013; Weitz et al. 2014; Beisheim 2013). On the latter, Beisheim (2013) highlights the need to understand how subsidies affect the nexus, and suggests that the greening of policies, price incentives that reflect negative externalities, and ecosystem services valuation could improve policy coherence and efficiency.

The economic rationality framing of the nexus emphasizes the coordinating role of governance: systems can be optimized by generating more information on cross-sector interactions so if institutions were better coordinated, the problem of unintended economic consequences and inefficiencies could be overcome. To achieve this, there is generally a preference in the literature for adapting existing governance arrangements rather than striving to create new or ideal ones (Stein et al. 2014). However, the literature offers only limited analysis of which governance architectures, mechanisms or tools would be most conducive to the desirable outcome of a nexus approach.

A political economy perspective

As noted above, much of the nexus literature tends to take a rather technical or administrative view of governance, concerned with producing information on cross-sector interactions to improve system performance as measured against security or economic criteria. A political economy perspective challenges this technical-administrative understanding, bringing in the decision-

making processes surrounding the nexus and the relationships among the actors involved. These processes are rarely referred to explicitly in the nexus literature. Instead, they are implied in the expression “handling trade-offs”, which comes across as a managerial process free of conflict and power relations. There are exceptions, however, in which a political economy perspective has been adopted and power relations, negotiations among different stakeholders, and the distribution of consequences are in focus. We recognize these contributions as responses to the generally technical-administrative tendencies of the nexus literature.

From a political economy perspective, handling trade-offs and producing integrated policy options is not merely a technical but a highly political exercise involving negotiation among different interests and actors. Nexus challenges or risks cannot be separated from the perceptions, interests and practices of the various actors involved and their relationships (Rees 2013; Allouche et al. 2014; Stein et al. 2014). We must therefore ask for whom and by whom is the nexus system optimized and whether optimization is even possible (see, e.g. Stein et al. 2014; Lele et al. 2013). Weitz et al. (2014) explore how the nexus approach can help to meet the Sustainable Development Goals (SDGs) and to bring to light the many connections between different goals and targets. They note that the goals are highly contextual, so impacts should be assessed taking socio-economic, environmental and political conditions into account, and be addressed through participative processes. A critical political economy perspective on the nexus helps to ensure that a nexus approach will contribute to improved equity and social progress (Dupar and Oates 2012; Stringer et al. 2014), and address questions of secure access to basic resources (Stein et al., 2014).

The key barriers to policy coherence from a political economy point of view are unequal distribution of power, voice, access to information, resources, and capacity among actors and institutions, as well as lack of political will (Lele et al. 2013; Perrone and Hornberger 2014). Further barriers include conflicting interests both within domestic policy, such as trade-offs between short-term wins and long-term sustainable solutions, and among actors within and beyond national borders. Authors writing from this perspective identify increasing understanding of the roles of and connections between policies, institutions and actors at different levels and their collective impact on outcomes as a strategy for overcoming these barriers (Lele et al. 2013). For example, Söderbaum and Granit (2014) argue that governance options should consider economic and social norms at the macro-regional level, cohesion or fragmentation of various national objectives at the national level, and concrete instances of competition and trade-offs between users at the basin or catchment level.

With regard to institutional reform, Stein et al. (2014) conclude, based on a case study in Ethiopia, that approaches that respect local preferences are likely to yield better outcomes than those seeking to achieve general, theoretically ideal institutions. In a similar way, Jobbins et al. (2015) caution that technical solutions to address water, energy and food security can have unintended negative consequences for other dimensions of poverty, such as rights, employment, health and education. They are concerned that encouraging poor farmers to focus on resource-use efficiency, however good the intention, can make their situation more precarious.

3 GOVERNANCE GAPS IN THE NEXUS LITERATURE

The nexus literature expresses great ambition to achieve policy coherence by identifying synergies and trade-offs, optimizing policy options, and adapting governance arrangements. Without clearly defining policy coherence in terms other than as an outcome to avoid unintended consequences from one sector on another, the nexus literature suggests several barriers to policy coherence. Common themes include: the mismatch between the scope of the challenge and the institutions handling it; divergent sectoral institutional frameworks and interests; lack of strategic clarity; and unequal distribution of power and capability across sectors and institutions. The literature also proposes options for overcoming these barriers, such as: cross-sector cooperation and communication; dialogue platforms or inter-agency mechanisms; sharing of best practice for integration; strengthening the representation of different actors, their perceptions and interests; collaborative agreements; co-learning; better understanding of supply risks; and economic instruments. While flagging up the broad scope of issues and calling for more attention to the political economy surrounding the nexus, the literature at large reflects a technical and administrative view of governance and focuses on its coordinating role. It provides some technical or administrative (hypothetical) options – which also feature in the literature on policy coherence and integration – but says little about whether or how these could be brought about or what shapes and determines coherent and integrative decision-making and policymaking across the nexus.

With its ambition the nexus literature clearly acknowledges that governance matters. However, it falls short of identifying three key dimensions of the barriers that it flags: why they exist, what influences them, and how they can be acted on. These three overarching gaps merit further attention. On the first, there is a need to explore *under what conditions cross-sector coordination and collaboration come about, and the enabling or hindering factors*. On the second, *the dynamics that influence the nexus, beyond cross-sector interactions, need to be better understood in order to deal with the mismatch in scale and scope between nexus issues and the institutions that are expected to handle them*. On the third, *the roles that politics, ideologies and cognitive factors play as determinants of change in the nexus need to be better understood*. Filling these gaps would help to overcome the limitations of the technical and administrative view of governance in the nexus and connect it with the dynamics of decision-making processes, from which it is currently disconnected. We elaborate below on the three gaps.

3.1 Gap 1. Under what conditions does cross-sector coordination and collaboration come about?

The general response to this question in the nexus literature, regardless of perspective, is that cross-sector coordination and cooperation will help to solve the fundamental governance problem that fragmented policies lead to unintended consequences for other sectors. From a risk perspective, lack of coordination is a problem because decisions that enhance security in one area (water, energy or food) may compromise security in other areas and cause conflict. From an economic-rationality perspective, coordination is needed because it can bring about more cost-effective allocation of resources. From a political economy perspective coordination is a must because success in “handling trade-offs” and achieving “policy coherence” is determined by the relationships among the actors involved. While it is a reasonable assumption that some degree of coordination and cooperation across sectors is necessary to address cross-sector connections, sectors often operate independently, even when inter-ministerial agencies are present. This suggests that fixing the organizational chart will not solve the fundamental problem, and the nexus literature does not enlighten us on what conditions would enable sectors, institutions and actors to coordinate and collaborate, or prevent them from doing so. Nor does it provide guidance on the practical tools needed to create and sustain these enabling conditions.

3.2 Gap 2. What dynamics, other than cross-sector interactions, influence decision-making and policymaking in the nexus?

A mismatch between the problems that arise from a lack of coordination and collaboration across the water, energy and food sectors and the ways in which institutions are arranged has been highlighted as problematic from all three perspectives. From an economic rationality perspective, for example, unclear rights and responsibilities across the three sectors, and their different institutional frameworks, can be problematic. The risk perspective brings into focus the influences from conditions at both the higher and the lower levels of ecosystems, governance arrangements, policy and supply chains. A political economy perspective raises concerns about conflicting interests among actors beyond national borders and how they pose barriers to policy coherence at the national level. This all suggests that there are other dynamics than the interaction between water, energy and food policy at the same administrative level (horizontal coherence) of relevance to the nexus. Nonetheless, once these points have been made, the nexus literature is heavily focused on horizontal coherence. This one-dimensional view of policy integration overlooks many aspects of multi-level governance systems. Including them would enrich the nexus literature's understanding of how policy areas influence each other and thus what policy coherence entails. This also means accepting that governance and decision-making are often messy and non-linear processes, influenced by both vertical and horizontal interactions.

3.3 Gap 3. What roles do political and cognitive factors play as determinants of change in the nexus?

This gap concerns the nexus literature's neglect of a number of factors that influence the current state of play and the feasibility of policy change. Much of the nexus literature appears to assume that information about demand and supply makes it possible to optimize resource use and avoid at least some of the nexus conflicts. Each of the three perspectives, however, has a different idea of why "optimization" is desirable. From the economic rationality perspective, optimization is framed as cost-efficient use and associated with business opportunities. From the risk perspective it is motivated by alleviating pressure and scarcities, and, by extension, violent conflict. From the political economy perspective, it is motivated by equitable distribution, asking whose interests are downplayed and who is given priority when different objectives are being balanced.

These different views on optimization suggest that what is perceived as "optimal" allocation is highly subjective and determined by different ideologies and rationales. The three broad perspectives of the nexus that we have applied in this paper reflect different ideologies and norms, which influence how nexus problems are defined and which possible responses would be attractive. Such ideologies and norms abound in decision-making over the nexus and make it highly political. While some authors have raised concerns about the politics of the nexus and called for more attention to it, the nexus literature generally ignores the political context in which technical information is to be absorbed and acted on, how in practice trade-offs across the nexus are negotiated and decisions made, and the ideological assumptions that different policy options rest on. As a result, the nexus remains disconnected from the decision-making and policymaking processes that could achieve the policy changes that it expects will flow from its technical analysis. Consideration of what we would call the deeper facets of governance theory, such as politics, norms and perceptions, could help connect the nexus with the policy-making and decision-making processes. Closing this gap could also encourage exploration of some of the underlying normative assumptions of the nexus, including questioning its prescription of policy coherence and integration. Our three perspectives have only exemplified this.

4 DISCUSSION AND CONCLUSION

Our review of the nexus literature and how it addresses governance identified three critical gaps. While the nexus literature expresses great ambition to achieve policy coherence and overcome the unintended consequences of uncoordinated policy, it offers little explanatory power as to why barriers to realizing such expectations are present, what influences them, and how they can be acted on. It does not elaborate on the conditions under which cross-sector coordination and collaboration come about. It pays little attention to dynamics other than cross-sector interactions that influence decision-making and policymaking, and it rarely considers the roles that political and cognitive factors play as determinants of change in the nexus. These gaps reflect the fact that the nexus literature – and probably also projects, programmes, and initiatives conceptualized as nexus – do not embrace deeper facets of governance theory such as norms, power relations and political negotiation which largely determine policy and action. As a result it remains disconnected from the realities of the decision-making and policymaking processes that it is ultimately seeking to influence. Closing these gaps would improve the policy relevance of nexus analysis and the governance insights and interventions it generates.

Despite these conceptual challenges, the popularity the nexus has gained among various actors and the attention it draws to connections between policy objectives across water, energy, and food production systems provide an opportunity to improve the coherence and alignment of management and decision-making and promote resource efficiency, sustainability and human development. To capture this opportunity, the nexus community would benefit from connecting with the governance community, which has an extensive pool of knowledge of relevance to the three gaps discussed in this paper. As noted in the introduction, much of the governance literature departs from a recognition that decision-making is complex and that institutions are linked through both vertical and horizontal interdependencies. There are, for example, a wealth of theoretical and conceptual perspectives within the integrative environmental governance literature (for an overview see e.g. Visseren-Hamakers 2015) that cry out to contribute to closing the governance gaps in the nexus literature. In a forthcoming journal article we explore this potential in more detail (Weitz et al. forthcoming).

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