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## **Title: Bringing Polycentric Systems into Focus for Environmental Governance**

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### **Why a special issue on polycentricity in EP&G?**

Polycentric governance involves multiple overlapping centers of decision-making, which interact within an overarching set of rules. Within the field of environmental governance, the advantage of polycentric governance systems is that they are supposed to help manage cross-scale environmental issues and address the complex interrelationships within our social and environmental systems. While polycentric governance is not new, we have seen growing attention in the environmental governance scholarship to polycentric forms of governance. These systems appear to be widespread globally - across multiple forms of government and political systems, across a range of environmental issues, and geographic locations. Moreover, existing empirical studies of these systems and practical evidence both suggest substantial diversity exists in the design and function of polycentric governance systems (Sovacool, 2011).

The attention paid in the social-environmental field to polycentricity comes with no surprise. Natural resource systems like lakes, rivers, forests and fisheries tend to cross political and administrative boundaries that confound pure centralized or decentralized approaches to governance. Additionally, many of the current environmental problems (e.g., climate change, biodiversity loss, nitrogen pollution) manifest at multiple scales, from the very local up to the global level, which creates significant challenges in terms of policy design and implementation (Ostrom, 2010; Galaz et al., 2012). Polycentricity offers a flexible enough conceptual framework to accommodate current environmental governance solutions, as well as inspire new ones.

Despite recognition of the diversity in polycentric governance systems and growing interest in how they function, long-standing conceptual, methodological and theoretical gaps remain unfilled. In part, these gaps stem from the fact that the idea of polycentric governance is nebulous, and can encompass many diverse approaches to governance. Additionally, given the perceived pervasiveness of polycentric governance, one may question whether all governance systems are, in fact, polycentric. Only pure centralized or decentralized systems, which are ideal types and elusive in practice, would fall outside the polycentricity space. If this is the case, the concept may not be useful for parsing out and analyzing what happens on the ground in environmental governance. We do not ascribe to these critiques of polycentric governance. Simply because a concept is difficult to define, or appear ubiquitous, does not render it

meaningless. Many of the most important and universal social science concepts (e.g., conflict, cooperation, networks, governance), in fact, are difficult to operationalize and measure. Yet, without common agreement among scholars in how to measure and assess these concepts, it is difficult for social scientists to offer useful practical insights on important societal questions. As a result, we need to push scholars to be more precise in our conceptual, theoretical, and empirical treatment of the concept.

This special issue aims to fill some of the conceptual, theoretical, and empirical gaps in the literature on polycentric governance, ultimately to inform our understanding of the diverse array of environmental governance systems and their performance. The papers in this special issue also collectively provide new insights on the methodological tools and theoretical approaches that can advance the field. In introducing this special issue, we first provide an overview of the literature on polycentric governance. We then introduce the reader to the empirical and theoretical contributions offered by the collection of articles in this special issue. To conclude, we discuss ideas for continuing to advance the research on polycentric systems for environmental and natural resource governance.

### **What do we know about polycentric environmental governance?**

Scanning the literature reviews of the articles in this special issue, along with other recent empirical and theoretical research on polycentric governance, we find some common underpinnings in the literature, but also several acknowledged limitations. From a definitional standpoint, much of the literature builds from the seminal work of Ostrom, Tiebout, and Warren (1961), in describing polycentric systems as having multiple independent centers of authority that overlap and coordinate through forms of cooperation, competition, conflict, and conflict resolution. Polycentric systems therefore depend on some level of constitutional authority afforded to a diversity of decision units, which is common in federalist and decentralized governance systems. Yet, it is the coordination or degree of interaction across these systems is what differentiates polycentric systems from fragmented systems (Pahl-Wostl and Kneiper, 2014). Not all decentralized systems, therefore, are polycentric. Additionally, it is likely that polycentric governance systems involve not only governmental units, but also agencies, quangos, and a myriad of stakeholder organizations (Hooghe and Marks, 2003). Related to this, governance systems are rarely static, nor are they homogenous across issue areas. For instance, a decentralized governance system in a given region may appear fragmented in its management of a coastal fishery, while its water governance may be more polycentric and overlapping. However, over time, the fishery governance system may become coordinated with the water governance system and develop certain elements of a polycentric system.

Much of the literature on polycentric governance has either argued theoretically for, or sought to empirically identify, the benefits of polycentric systems, especially when compared to more centralized or fragmented systems. These benefits include greater citizen access to decision-

making, better institutional fit because institutions can be tailored to specific issues, more opportunities for policy experimentation and adaptation, and a reduced likelihood that institutions will fail because of the diversity in institutional design (Folke et al., 2007; McGinnis and Walker, 2010; Ostrom, 2010; Pahl-Wostl, 2009; Cole, 2015; Carlisle and Gruby, 2017). These advantages of polycentric systems can also result in better environmental outcomes (Newig and Fritsch, 2009). However, some scholars also recognize and examine the limits to polycentric governance. For instance, problems of accountability can arise if no single authority is responsible for collective outcomes, or they can lead to inefficient decision processes, or result in differential benefits and costs – or inequities – assigned to citizens within those systems (Lieberman, 2001; Wyborn, 2015; Morrison, 2017).

While many environmental governance scholars have examined the theoretical benefits and costs of polycentric systems, the research remains deficient on several fronts. First, studies that examine cases of polycentric systems often lack precise or replicable measurement of the features of polycentric governance. Replicable measurement is needed to unpack the differentiation in institutional design across polycentric systems (Aligica and Tarko, 2012). In part, this limitation in the literature has stemmed from the binary view of polycentricity. That is, polycentric systems are simply defined as either polycentric or not, and then scholars assess how those systems function. As noted earlier, polycentric systems vary widely in design and function and more attention to that diversity is needed to effectively understand them.

Additionally, the empirical methods for assessing polycentric governance systems require innovations. In particular, we need rigorous and reliable approaches for comparing across and within cases of polycentric governance (within the same sector, as well as across sectors and with regard to multi-sector issues). Such comparisons can help us unpack why we find differences in the institutional design of polycentric systems, as well as improve our explanations of the relationship between the design of polycentric systems and performance. We also need more attention to historical and longitudinal analysis techniques to understand whether and how systems evolve, and who within those systems create opportunities for or constrain such evolution (e.g., see McCord et al., 2016; Baldwin et al., 2016). Finally, there is an empirical bias in the dominant focus on traditional common-pool resources (e.g., water allocation, water quality, deforestation, fisheries diversity) and the lack of interest in interactions across sectors. To aid in these types of analyses, scholars may need to establish larger datasets, which can then further test theoretical expectations about the relationship between the design of polycentric systems, the actors and their strategies in these systems, and their environmental and social outcomes (e.g., see Pahl-Wostl & Knieper, 2014). As suggested above, a necessary foundation for all of this work is more consistency in how we operationally define and engage with the concept of polycentric governance, its component features, and the actors that design and interact within them.

Finally, the scholarship needs to advance theoretical knowledge about the functioning, performance, and forms of interaction in polycentric systems. In particular, our understanding of “agency” in these systems remains underdeveloped. It is the choices and decisions of actors -

both individual and organizational - which allow polycentric systems to function and establish the interactions and connectivity across the systems. Yet, attention to actors is often missing from analyses that focus on the “system” and system outcomes. Related to this challenge, few studies of the evolution of polycentricity exist, i.e., studies that illustrate how governance systems move from (de)centralized to polycentric governance, and across types of polycentric governance.

### **How does this special issue move the field forward?**

This special brings together scholars who are working on the cutting edge of polycentric governance research. The scholars invited for this special issue share some of the basic conceptual definitions of polycentric governance but approach their research using diverse methods, tools, substantive environmental issues, and geographic locations. The collective result is that these papers help build new evidence on the nature and functioning of polycentric governance and advance theory. Here we summarize some of the novel empirical and theoretical contributions of the papers. Rather than summarizing each paper independently (which the abstracts already provide), we draw shared empirical and theoretical insights across the suite of papers, with an eye on the gaps mentioned in the above section.

#### ***Conceptual progress***

The articles in this special issue make a special effort to define and measure the concept of polycentricity, its characteristics, and the performance of polycentric governance systems, building on and advancing existing polycentricity theory. The authors start by establishing conceptual refinements to the underlying constructs or features of polycentricity. For example, Villamayor-Tomas proposes an operationalization for the water and energy sectors of Aligica and Tarko’s (2012) framework, via a series of questions that distinguish provision from production tasks. Heikkila and Weible’s (2018) study demonstrates how the idea of “multiple centers of authority” is more nuanced than what the literature presents. They recognize that systems can have core and peripheral centers of authority, which may be important to assess when determining how polycentric a system is on the ground. Similarly, Schröder (2018) argues that differences in the ways in which responsibilities are distributed in a polycentric system matters for implementation of governance outcomes. Schröder’s article further illustrates how to systematically assess polycentricity by first specifying the good or problem addressed, its scale, the tasks and authorities involved in potentially solving that problem, and the different types of overlap between the decision making authorities. Thiel and Moser (2018) advance a conceptual approach to account for the social characteristics of environmental governance problems to explore the design and performance of polycentric institutions.

#### ***Methodological and empirical advancements***

A number of the articles in this special issue also have used novel methods to measure polycentricity. One of these approaches is the use of semi-automated textual analyses of formal policies to look at how the component features polycentricity vary across subsets of institutions within a broader governance system (Heikkila and Weible). In doing so, Heikkila and Weible illustrate how identifying the rules that apply to different types of actors is critical when

measuring multiple centers of authority in a polycentric system. Another contribution from the papers in the special issue is the use of survey methods of the governance actors within the system (e.g., see Baldwin et al. 2018 and Mewhirter et al. 2018). Mewhirter et al. further demonstrate how to use network analyses from surveys of actors in a polycentric system to understand the interdependencies across decision-making centers. Other methodological advancements offered in the papers help unpack the longitudinal elements of polycentric systems, including process tracing (Tormos and Garcia Lopez 2018), reduced form analysis (Thiel and Moser) and historical assessment (Carlisle and Gruby 2018). Several papers also combine diverse data sources (e.g., interviews, document analyses, surveys) to build more rigorous and nuanced case-studies (Villamayor-Tomas 2018; Baldwin et al. 2018; Schröder 2018).

The articles in this special issue further extend the empirical evidence of polycentric environmental governance by examining contexts that have not been explored in previous research. Much of the prior literature has focused on classic “common pool resource” (CPR) settings such as water and fisheries. While we include articles that fit within these more classic settings (e.g., Baldwin et al. 2018, Carlisle and Gruby 2018), the special issue includes cases that are not classic CPR settings, such as polycentric social movements in climate justice (Tormos and Garcia Lopez 2018) and oil and gas regulations (Heikkila and Weible 2018); and biofuels (Thiel and Moser 2018). Additionally, the special issue offers advancements in understanding the more classic CPR settings, by paying attention to multi-dimensional problems such as the maintenance of the ecological health of urban water systems (Schröder 2018) or the management of water and energy by user associations/organizations (Villamayor-Tomas 2018). Schröder’s (2018), she argues that the maintenance of ecological health in water systems in Berlin and Hamburg involves the governance of least four features of the resource system, including chemical water quality, water quantity, connectivity for fishers, and morphology. Villamayor-Tomas, in turn, shows how the adaptative capacity of Water User Associations in Spain depends on their authority and leverage for action across the water and electricity sectors, illustrating ongoing tensions between polycentricity and centralization forces, respectively.

Also, articles in this special issue make an effort to feature polycentricity transitions. Baldwin et al. compare a pre-polycentricity reform period with a post-reform period. The study of the adjustment process that followed the reform allows the authors to disentangle the importance of bottom-up collective action to complete top-down polycentric design processes. Villamayor-Tomas carries an over-time analysis to assess the responses of water user associations to droughts and the rise in electricity prices. Differences across the water and electricity governance systems are then used to explain the number and effectiveness of said responses. Tormos and Garcia Lopez (2018) examine the emergence and evolution of the climate justice movement over a four decades (1980s to 2016). Tracing the movements illustrates the potential for politics to transform polycentric governance arrangements to foster experimentation and inclusion of marginalized actors.

***New theoretical insights: agency, performance, and beyond***

Beyond the conceptual and empirical advancements, the special issue presents new theoretical insights on how the actors and their interactions within polycentric systems operate. For instance, actors can learn to adapt to or overcome some of the externalities imposed when they participate in different decision units in the polycentric system (Mewhirter et al. 2018). Actors can also engage in bottom-up or to-down collective action in various ways that can enhance the functioning of polycentric systems (Baldwin et al. 2018; Villamayor-Tomas 2018). Actors can also resist changes introducing competition and the coexistence of multiple decision-making centers in centralized/oligopolistic systems (Villamayor-Tomas 2018).

Bringing in more actor-centered approaches clarifies some of the fundamental mechanisms that produce outcomes in polycentric systems. It also provides linkages between systems-level theories of institutional design and more actor-centered theories that can inform how decision-making and different types of hypothesized interactions (e.g., conflict, cooperation) arise in polycentric systems. As shown by Tormos and Garcial-Lopez (2018), which looks at the structure and strategic lobbying activities carried by the climate justice movement at multiple levels of governmental decision-making, political struggles and conflicts shape polycentric governance arrangements, and their potential for transformation. From this analysis, Tormos and García-Lopez (2018) propose avenues for integrating the role of power and politics in the study of polycentricity.

The efforts by the authors in this special issue to expand polycentricity theory go beyond the emphasis on agency, and include insights on the design of polycentric systems. As one example, Villamayor-Tomas (2018) takes on Aligica and Tarko's (2012) proposal of distinguishing different types of polycentric governance systems. He examines the Spanish electricity and water governance systems with regard to 11 characteristics that inform about the multiplicity and autonomy of decision centers, the overarching system of rules, and evolutionary competition. Although the water governance sector fulfills more polycentricity traits than the electricity sector, both can be considered polycentric in different regards. Heikkila and Weible's article further illustrates that we can find variance in the degree of polycentricity within subsets a given polycentric system, based on the rules that structure which actors and which types of interactions are required or allowed to engage on different policy issues. In the case of an oil and gas governance system in Colorado, they show that higher degrees of polycentricity can be found in relation to air quality regulation than around the regulation of siting/locating wells.

The theoretical insights from this special also address the performance of polycentric governance. Some of the articles offer empirical validation of existing expectations about the performance of polycentric systems polycentric systems. For instance, Tormos and Garcia Lopez (2018) find that polycentric social movements can foster experimentation and innovation around climate governance. Villamayor-Tomas recognizes the need for sufficient levels of autonomy and well-established rules that govern the interactions of decision units across systems for performance. Baldwin and colleagues further highlight that by focusing on a particular aspect of performance – in their case the ability of actors in a polycentric system to engage in collective action – scholars can uncover additional features that may be important to assessing performance. Thiel and Moser (2018) call for a focus on the social characteristics to

support more systematic evaluation of performance, including the effect of differences in constitutional rules (e.g. decentralization or centralization) in regions addressing problems with similar social characteristics. They also call for enlarging the range of criteria used to assess polycentric governance to include flexibility, resilience and equity alongside effectiveness and efficiency.

Understanding the limitations of polycentric governance systems is also an important area of theoretical advancement. For example, two of the articles consider the ways in which power imbalances can arise in polycentric governance and constrain performance (Carlisle and Gruby 2018; Tormos and Garcia Lopez 2018). Specifically, Carlisle and Gruby's (2018) analysis of fisheries governance in Palau finds that systems that rely more heavily on government actors in decision-making, at the expense of resource users, can impair institutional fit and compliance. They further point out how polycentric systems can evolve in unpredictable ways and become less polycentric. Another limitation of polycentric systems that is highlighted in the special issue is the issue of externalities (or how decisions in one unit of decision-making authority affect another). This theme is central to Mewhirter et al. (2018), which explores how externalities associated with decisions across different units of governance decision-making can affect performance.

### **Where does the field go next?**

Empirically, one of the critical next steps is further testing the theoretical expectations from the literature advanced in this special issue in new substantive arenas. The literature, to date, has focused heavily on environmental issues. So extending into other policy topics or public service areas, such as health care, education, security, and immigration would help test the theoretical boundaries of the literature.

In terms of the methods of research, we encourage scholars to continue methodological innovation, strengthening existing approaches and expanding into new frontiers. This special issue featured mixed methods approaches, longitudinal research, network analyses, comparative analyses, and automated coding. In addition, a critical challenge in applying diverse methods is understanding the rules in use that govern polycentric systems (see Carlisle and Gruby 2018). Methods of coding formal rules have been advanced significantly by the approaches used in Heikkila and Weible (2018) (e.g., semi-automated tools, and the institutional grammar tool), but they have not been similarly advanced for the rules-in-use or informal rules. Beyond the examples in this special issue, we would further recommend building off the extensive case studies in the existing literature by conducting meta-analyses. This requires developing common coding protocols or shared databases to make cases comparable across key substantive areas.

Theoretically, we see several important next steps. First is building new insights on the evolution and dynamics of polycentric systems. Related to this, it is valuable to study how governance systems influence each other across sectors (Villamayor-Tomas 2018). As pointed

by Aligica and Tarko (2012) “the structure and dynamics of a polycentric system is a function of the presence of polycentrism in the governance of the other related and adjoined systems... any island of polycentric order entails and presses for polycentricism in other areas, creating a tension toward change in its direction” (p. 247). Further research on cross-sector spillovers (deforestation and water scarcity, water and energy use trade-offs, land and water use) could test such a hypothesis. Second, more sophisticated theorizing about how context matters for determining the structures and functions of polycentric systems is needed (see Baldwin et al. and Thiel and Moser). Related to this is the need to examine “the relationship between functionality and polycentric governance systems exhibiting varying degrees or configurations of local- and higher-level decision making” (Carlisle and Gruby 2018, pg. 223). Finally, polycentric governance scholars cannot ignore the political dimensions of polycentricity. As illustrated by Tormos and Garcia Lopez (2018), issues of power and justice in polycentric system matter and can affect interactions, outcomes, and performance. Another important way to fill the gap is further integrating polycentricity theory with the theory of democracy (Skelcher, 2005). Lowery (1999), for example, indicates that, while the polycentricity paradigm provides an alternative to monopoly production of public services by self-interested bureaucrats, it does not fully address issues of democratic control of elected officials making provision decisions.

In closing, the articles in this special issue provide several conceptual, methodological, and theoretical advancements in the scholarship on polycentric governance in the environmental and natural resource management field. However, these contributions are just a starting point. We hope they will inspire additional efforts to replicate and test the ideas and approaches presented in the special issue. Yet, we also recognize the polycentric nature of environmental governance scholarship. Thus, we expect and encourage environmental policy and governance scholars to pose their critiques, experiment with new ideas, and offer recommendations for how we continue to improve the literature on polycentric governance in ways that this collection of articles has not yet captured.



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