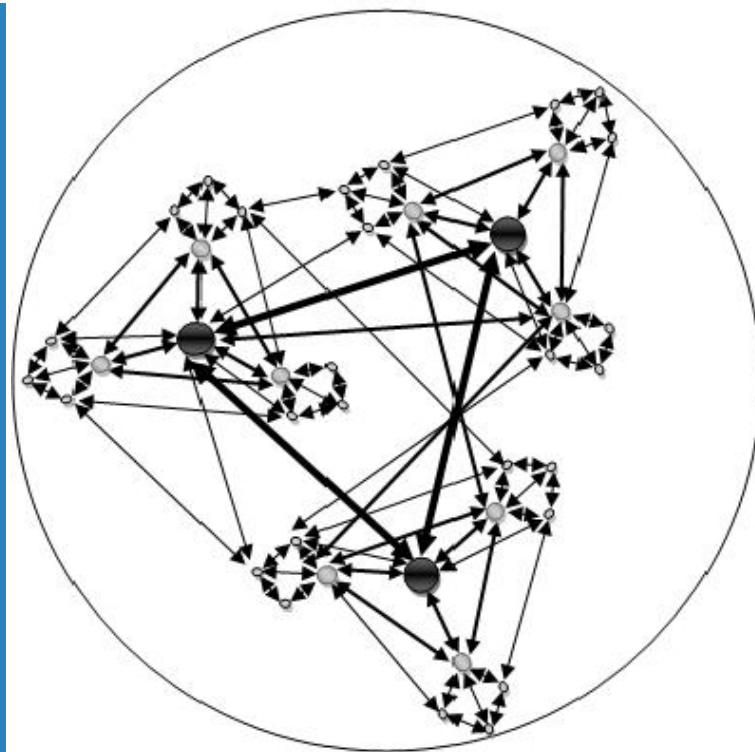


The polycentricity approach and the research challenges confronting environmental governance

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Andreas Thiel (Humboldt-Universität zu Berlin)

Abstract

Literature on environmental governance has shown renewed interest in polycentricity and polycentric governance, a perspective that has been first suggested by Vincent and Elinor Ostrom throughout studies of metropolitan governance in the sixties. This paper is to provide greater clarity to the recent discussions of polycentricity by introducing the polycentricity approach based on the different roles that the concepts of polycentricity and polycentric governance and associated theoretical claims adopt in research on environmental governance. The polycentricity approach aims to connect these perspectives in a coherent way. Based on revisiting the Ostroms' writings on polycentricity, I distinguish between its use as ontological, operationalizing and sensitizing concept, as normative and positive theory, and as analytical framework. I use these perspectives to review the literature on environmental governance that relates to polycentric governance. The distinction of uses of concepts proves helpful to organize the literature and uncover research gaps. These gaps are: the role of constitutional and meta-constitutional rules and social problem characteristics for polycentric governance, ways to distinguish the domain of overarching rules and the domain of polycentric governance, the way polycentric governance shapes public agents' behavior in acts of public service provision, and the relation between constitutional rules, polycentric governance structures and innovative criteria to evaluate social-ecological system performance such as robustness, resilience, etc. The polycentricity approach allows us to coherently link these gaps in one framework guiding research.

Keywords: governance, polycentricity, institutional analysis, constitutional rules, research

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1 Introduction

The terms polycentricity and polycentric governance¹ were introduced and elaborated by Vincent and Elinor Ostrom in the sixties and seventies of the last century, representing an analytical concept that has been around for a long time but whose understanding has only partially been enhanced (Aligica 2014). Using these terms, research concerning the way nested sets of institutions (i.e. rules in use that describe regularized ways of behaviour of actors) shape the behaviour of interdependent actors and its performance has been developed. Specifically, those that first coined the terms, the Ostroms and the Bloomington school, set out to test this theory in the sixties and seventies through work on the structures shaping local public economies and Metropolitan governance, and, more specifically, policing (cf. Parks and Oakerson, 2000). McGinnis (2011), one of the core members of the Bloomington school², defines governance as “process by which the repertoire of rules, norms, and strategies that guide behaviour within a given realm of policy interactions are formed, applied, interpreted, and reformed.” More concrete in relation to our object, the environment, Paavola (2007) defines environmental governance as “the establishment, reaffirmation or change of institutions to resolve conflicts over environmental resources” in relation to all environmental resources and scales at which problems and solutions are defined. For him governance solutions reach beyond policy interactions, which is similarly one of the interests of polycentricity. The initial contribution by Ostrom, Tiebout and Warren (1961, 831) defines polycentric governance as follows: “Polycentric connotes many centers of decision-making which are formally independent of each other.... To the extent that they take each other into account in competitive relationships, ...[they]...enter into various contractual and cooperative undertakings or have recourse to central mechanisms to resolve conflicts..., the various political jurisdictions in a [functionally interlinked] ...area may function in a coherent manner with consistent and predictable patterns of interacting behaviour. To the extent that this is said to be so, they may be said to function as a “system”.” To provide an empirical illustration of a system like this, some argue that the way the American federal state was set up is probably closest to the kind of polycentric society that the authors had in mind. This idea connotes an understanding of polycentricity as a descriptive concept (see below), which, given the way its key proponents developed it over time, later evolved into additional understandings of polycentricity as normative and positive theory and as analytical framework (see also my elaboration on these terms below). Based on this definition of governance and polycentric constellations, the overall polycentricity approach portrays a functionalist, ahistorical perspective on governance in contrast to the one of many European political scientists (Rhodes, 1995), which investigates what makes specific kinds of governance emerge and what determines their functioning, performance and evolution. That way the polycentricity approach aims at theory building similar to fiscal federalism (Oates, 1972), polyarchy (Dahl, 1984), and functionalist

¹ In this paper I use polycentricity and polycentric governance as synonymous.

² As Bloomington I consider scholars that develop their work in relation to the thinking developed by Vincent and Elinor Ostrom, founders of the Vincent and Elinor Ostrom Workshop in Political Theory and Policy Analysis

approaches to the analysis of multi-level governance (Hooghe and Marks, 2004) and the explanation of its development (Putnam, 1988; Scharpf, 1997). However, while sharing certain features with all of these perspectives the approach also goes beyond them by proposing a more comprehensive perspective on the determining factors of governance and its performance.

Recently, polycentricity, equated with polycentric governance, seems to experience renewed interest. A brief review through Scopus and Web of Knowledge confirms that since the beginning of the last decade its application has been increasing. Use of the concept is most prominent in planning studies addressing metropolitan areas and network types of governance. In these types of studies polycentricity refers to spatialized urban development and governance (models) in metropolitan areas (Giffinger and Suitner 2014). This is followed by environmental social sciences with the most prominent representative being Elinor Ostrom (Ostrom 2010c). Her much praised work on local common pool resource management is deeply grounded in the polycentricity approach. The polycentricity approach comprises of three distinct but interlinked elements. It is constituted by the descriptive concept of polycentric governance, a normative theory concerning what leads to polycentric governance which is considered desirable on the whole, a positive theory that hypothesizes what elements determine specific types of governance, and an analytical framework that aims to examine the explanatory and normative claims of positive and normative polycentricity theory. The overarching research interest of the approach, the interaction between institutions, behaviour of interdependent actors and its performance and methodological individualism provide the common core of the approach. These tenets are also shared by the successful Institutional Analysis and Development (IAD) framework addressing the role of institutions in local collective action situations that Elinor Ostrom and colleagues built and applied extensively (Oakerson and Parks 2011).

McGinnis and Ostrom (2012) reconstruct the development and basic theoretical tenets of the approach and the way it departed from its public choice origins. Specifically, the possibility of multiple rationalities of action and normative orientations and perceptions of agents, the role of entrepreneurship within a well-structured normative constitutional order in the interrelated public and private economic and political spheres, and reliance on a multiplicity of governance arrangements seem to crystallize as key features of the approach. Scholarship on social-ecological resilience was also greatly inspired by Ostrom's work on common pool resources. It is of prevalent importance to the environment and social-ecological systems, i.e. non-linear systems intricately linking social and ecological systems (Anderies et al., 2004). For either, polycentric governance is widely considered to be desirable, making social-ecological systems more resilient, adaptive and sustainable (Huiteima et al., 2009). According to Schoon and colleagues (Schoon, Robards, Meek and Galaz, 2015), the polycentricity concept provides opportunities for enhanced learning and experimentation, it enables broader levels of participation, it improves connectivity across governance scales, it creates possibilities for response diversity and builds redundancy that can minimize and correct errors in governance. Even in policy-making circles polycentric

governance is increasingly being advocated – however, oftentimes it remains unclear what exactly the concept stands for in these discourses, and why it should be considered desirable.

In this paper, I aim to present a more differentiated understanding of the way research grapples with polycentric governance by developing what I want to call “the polycentricity approach”. First, I pursue the questions what the different roles are that polycentricity adopts in research on environmental governance, if they can be connected to each other, and what the ensuing research is that emerges from such an overarching approach. This exposition is structured through an understanding of the terms concept, normative and positive theory and analytical framework to polycentric governance. Second, in order to examine this operationalization of the polycentricity approach, I review literature addressing environmental governance that refers to the term polycentricity and examine how it relates to the components of the polycentricity approach. The review will prove helpful for organizing this literature and allowing us to identify avenues for future research on environmental governance from the perspective of the polycentricity approach.

2 A framework for discussing literature on polycentric governance

To structure the discussion, I use three instruments of social science research: concept, analytical framework and theory. Following Blaikie (2000, 129), a concept expresses an idea in words (or symbols) that is used as building block in social science theories. “If the concept is clear as to what it refers, then sure identification of the empirical instances may be made” (Blumer 1969, 143 quoted by Blaikie 2000, 129). Blaikie distinguishes three roles of concepts: a) the ontological tradition associates concepts with a community of social scientists and identifies basic features of the social world; b) the operationalizing tradition turns concepts into variables in order to define them and develop ways of measuring them; c) the sensitizing use holds that concepts provide suggestions about what to look for and to search for commonalities between observations (Blaikie 2000, 130–140).

As second class of social science instruments, analytical frameworks consist of a family of theories that adhere to common underlying assumptions, making them internally consistent (Blaikie 2000). An example of this understanding is Ostrom’s Institutional Analysis and Development (IAD) framework which provides a precursor to the application of game theoretical analysis of complex settings making. The IAD and game theory therefore share methodological individualism as a core tenet. Schlager (1999, 234) writes that such “[f]rameworks bound inquiry and direct attention of the analyst to critical features of the social and physical landscape. [...] [T]hey specify classes of variables and general relationships among them, that is, how the general classes of variables loosely fit together into a coherent structure.” In this paper, the term analytical framework will be used where frameworks provide (constraining) cognitive (ontological) maps (Aligica 2006) but also adopt a sensitizing role.

Theories and frameworks are two interrelated but distinct instruments in social science. For the purpose of this paper, I adopt the understanding of theories of the Bloomington school. Thus, “explanation and prediction lie in the realm of theories” (Schlager 1999, 234; Ostrom 2005). Theories “place value (only) on some of the variables identified as important in a framework, posit relationships among the variables, and make predictions about likely outcomes” (Schlager 1999, 240). We distinguish between normative theories that make hypothetical, value-laden statements about ways in which societies organize themselves in order to comply with certain performance criteria that are considered desirable, and descriptive, or positive theories that explain societal phenomena and performance. Below, I use this distinction in order to characterize different aspects of the polycentricity approach.

In the following review of the way polycentricity and polycentric governance were portrayed by the Ostroms and the way they were used in literature on environmental governance, I will make use of the above-introduced perspectives. I argue that it is necessary to identify these different uses of the term polycentricity and to consider the interrelations between them in order to fully grasp the polycentricity approach. To summarize, the paper distinguishes the following use of the terms in relation to polycentricity:

a) The concepts of polycentricity of governance or polycentric governance describe (polycentricity-related) structural features of static governance arrangements. These terms may be used in an ontological (what exists), operationalizing (how to measure what is assumed to exist) or sensitizing tradition (what may be interesting aspects to address in research).

b) The normative theory of polycentricity refers to propositions about the interrelations between a set of conceptualized, presumed variables and their effect upon a specific, desirable outcome. The normative theory is based on the first publication on the subject by Ostrom, Tiebout and Warren (1961). It is not accepted or corroborated. This posits polycentricity as an endeavour in positive, explanatory theory development on environmental governance

c) The polycentricity framework describes an analytical framework that consists of the conceptual building blocks that polycentric governance and its desired/hypothetical performance are embedded in. Causal relations and what are dependent and independent variables in the polycentricity framework are highly aggregated. This perspective could also be called the polycentricity lens because research needs to zoom in on specific components of overarching polycentricity theory.

In what follows, I want to further elaborate on these components of the polycentricity approach and how they interrelate before I utilize this structure to review recent literature on environmental governance.

3 The concept of polycentric governance

In its use as a concept, polycentric governance describes a specific, static structural configuration of governance. It is probably best captured through the original definition of polycentricity by Ostrom, Tiebout and Warren (1961, 831) which was presented above. This definition aims to provide clues about whether a specific configuration of governance was polycentric. It is not interested in the dynamics of how it emerged, sustains or outlives itself.

Van Zeben (2013) shows the multi-dimensionality of the concept. She describes its dimensions of multi-actor, cross-level and sectoral relations between functionally interrelated ways of resolving coordination and conflict for multiple purposes. She highlights that these institutionalized modes of interrelation need to be nested in an overarching structure of institutions. Due to its multi-dimensionality, the concept of structural (static) polycentricity is often equated only with a subset of the dimensions referred to above. Thus, governance configurations are called polycentric when multiple actors are involved, but this does not necessarily mean that the corresponding governance configuration also involves multiple levels and sectors. As a consequence, academics struggle with operationalizing the concept and measuring it (Aligica and Tarko 2012) because of its multi-dimensionality and comprehensiveness.³ For example Pahl-Wostl and Knieper (2014), informed also by other authors, break polycentric governance down in a way that many authors would follow nowadays: “Polycentric regimes combine distribution of power and authority with effective coordination among various centres and across spatial levels.” (see also: Ostrom 2010a; Folke et al. 2005). While such an approach is necessary because it makes it operationalizable for comparative work, it leaves out dimensions, such as the role of overarching rules, or multiple rationalities and purposes of actors and entrepreneurship.

Specifically, the original publication of 1961 by Vincent Ostrom and colleagues posited that polycentric governance and its underlying conditions emerge somehow on the same level as decisions about provision and production. Thus, the causal structure underlying polycentric governance and its linkages to performance were not made explicit. For example, they overlooked that polycentric governance would be intermediate to production and itself depend on constitutional and collective choice rules. Only later did the Ostroms disentangle preconditions of polycentricity, what drives it on the one hand and its output and outcomes on the other (Ostrom 1999c). As a result, a comprehensive picture of what I want to call “positive and normative polycentricity theory” emerged.

³ It seems that most of the environmental management related literature we found throughout an extensive review of peer-reviewed literature, uses a reduced set of dimensions of the static structural concept of polycentricity either in an ontological, operationalizing or sensitizing way (cf. da Silveira and Richards (2013); Galaz et al. (2012); Gruby and Basurto (2014); Ostrom (2012); Sproule-Jones (2002)).

4 Polycentricity theory

4.1 Normative polycentricity theory

What I want to call normative polycentricity theory suggests what ideally needs to be in place for polycentric governance to emerge and what the virtues of polycentric governance are. In their first, seminal publication on polycentricity, Ostrom, Tiebout and Warren (1961) emphasised the structuralist (static) understanding of polycentric governance and postulated that it would lead to second best efficient production of public goods and/or exploiting economies of scale as a result of flexible, adaptive self-organisation among jurisdictions. The understanding implied: a) constant negotiation between efficiency in production and alternative, normative values concerning provision and production of public goods, such as clean water, public safety, or the like; b) control, i.e. the determination of boundaries, so that the political jurisdiction includes the relevant set of events to be controlled; c) political representation, so that appropriate political interests are represented in decision-making arrangements; and d) that public enterprises will be controlled by the decisions of its constituents.

Vincent Ostrom's approach to polycentricity illustrates a meta-theory, distant from specific cases. The specific shape of governance he developed throughout later publications depends upon contingent, emergent dynamics and features of the setting. Whether or not polycentric governance emerges depends upon fulfillment of constitutional choice level conditions. Hereby following the understandings of the Bloomington School, constitutional level rules are defined as those rules that determine who in a community is eligible to make choices about who is entitled to make the rules according to which the community lives (Ostrom, 2005). In what follows I describe a) V. Ostrom's normative assumptions concerning constitutional rules and overarching institutional framework, and how they combine with b) the Ostroms' ontological position concerning the characteristics of social problems and aspects of governance. These can be considered foundational for polycentric governance (4.1.1 and 4.1.2).

To get to the elements of what I want to call normative polycentricity theory, the structural, static perspective on polycentric governance is embedded as follows: Precursors to the development of polycentric governance are compliance with specific constitutional prescriptions and overarching, non-polycentric rules (see table 1) and variability of social problem characteristics. Embedded in that way, polycentric governance will lead to tension where several performance criteria (a) efficiency, b) control, c) political representation, d) accountability) are continuously being traded off (see section 3; see figure 1). In such contexts, provision and production of public and common pool goods and services that does not satisfy expectations of consumers would be punished because actors could exit from the corresponding consumption-provision relation, or they could switch to or establish alternative organizations. If consumers were to self-organize this would bring spontaneous self-organization to the fore (i.e. what Ostrom 1980 has called public and private entrepreneur- or artisan-ship). That way, previous providers would be punished through

decrease in membership and/or (tax-like) contributions to the provision of public goods or services.

Implicitly, at this early moment, Ostrom seems to presume intendedly rational actors (consumers and producers) (Simon 1962, 16 quoted by Williamson 1985, 45), and it is only later that the Ostroms make behavioral responses to institutions an object of their research (Ostrom and Ostrom 1999a, 107). Therefore, I separately elaborate on this perspective below. The normative theory of polycentricity can be considered a structuralist approach that emphasizes the competitive evolutionary selection of forms of organization for the provision and production of public goods and services as a result of (perceived) variations in characteristics of social problems and underlying constitutional (and meta-constitutional) conditions. McGinnis (2005, 13) aptly describes the resulting dynamic when he writes that “[a]s long as a polycentric system is in operation we should expect to observe unending processes of change and re-negotiation, as new collective entities are formed, old ones dissolve, and new bargains are arrived at to deal with an unending series of new issues of public policy. If this can be said to be an equilibrium, it is a radically dynamic one with nothing fixed except the underlying complexity of the system as a whole.”

4.1.1 The ontological conditions at the origin of polycentric governance

An ontological position describes what theorists presume to exist. In this regard, Vincent Ostrom holds that characteristics of societal problems greatly differ among each other which make them the root cause of polycentric governance. Against this background, one role of analysts is to uncover how specific characteristics of social problems shape the way they are best addressed. For example, Ostrom, Tiebout and Warren (1961) singled out characteristics of public goods along which they vary and which, from a welfarist perspective, can make provision and production a social problem. They address subtractable and non-subtractable goods (i.e. common pool resources and pure public goods) (Ostrom and Ostrom 1999b; Ostrom 2003; 2010a). These goods are characterized by externalities because of undue costs of excluding others from their effects, the spatial scale and associated (part of a) jurisdiction/subset of a community across which these positive or negative externalities extend, the packageability of the goods, and difficulties to measure input-output relations. As a result, public goods need to be financed through taxes although they could also be financed publicly (cf. Ostrom, Tiebout, and Warren 1961, 832ff.). This brings us to the second ontological position, social heterogeneity, whose relevance has recently been re-emphasized by Aligica in his insightful treatment of the theoretical work of the Ostroms (Aligica 2014, 4ff). He sees the Ostroms’ work to be crucially influenced by their attempt to devise a theoretical approach focusing on collectives which allows dealing with social heterogeneity: heterogeneity in capabilities, preferences, beliefs and information around which collective action may be organized, all of which also result in a variety of forms of governance for specific social problems, which, as such, are also more likely to represent a polycentric system. Such reasoning directly relates to Malik’s (2013) emphasis of the role of diverse social covenants in collective action, which can be seen as devices instrumental to the formation of collectives. The third ontological position refers to governance. Ostrom,

Tiebout and Warren (1961) introduce the notion of what was later called “governance functions”. These authors consider governance functions to be divisible among each other (McGinnis 2011; Oakerson and Parks 2011). The presumption is that aspects of governance such as provision, production, consumption, monitoring, and conflict resolution can be spread out across different levels and actors in public economies. Even if we presumed embeddedness into equal constitutional conditions, as a result of the first and second ontological conditions, we expect the way governance is organized to show great variations across cases.

4.1.2 The normative constitutional conditions underlying polycentric governance

The normative position refers to an idealized perspective on a social system which considers polycentric governance as desirable for the performance features -described above. Its emergence depends on particular, idealized constitutional conditions which allow polycentric governance to emerge and which are addressed in this section (see also table 1). These relate to the formal and informal, constitutional, collective choice and meta-constitutional rules within which society organizes governance. In the initial publication by V. Ostrom Tiebout and Warren (1961), these were only mentioned implicitly, and the underlying causal structure was not made explicit. Later on, Ostrom detailed ideas about normative assumptions or preconditions for polycentric governance to emerge. In this regard, he largely relies on the work of Polanyi (1953) (V. Ostrom 1999b). Aligica and Tarko (2012) reduce these constitutional rules to the enabling conditions for spontaneous self-organization in the sense of freedom to organize, to enter into an organization or to leave it, and to voice contestation. Such prescriptions are to insure that public administrators’ actions and decisions are subject to legitimization by those that benefit from and pay for services (consumers, taxpayers). Concerning the overarching level into which polycentric governance is embedded, Ostrom and colleagues further state that “[g]overnments, [...] can provide an appropriate institutional framework for the maintenance of polycentricity in various sectors of society, but an institutional framework which can uphold independent positions” does not apply to the organization of government itself (Ostrom, Tiebout, and Warren 1961, 63). With this recognition, they posit the challenge of disentangling tasks that maintain polycentricity, which therefore cannot be organized in a polycentric fashion and tasks that are performed within the context of these preconditions. Hooghe and Marks, for example, suggested that distributional tasks and provision of non-excludable public goods would be best fulfilled by non-polycentric, national-level, multi-purpose governance arrangements (Hooghe and Marks 2004). Another basic condition was that polycentricity was constituted not only in the provision of public goods and services, but also in other spheres of societal organization and functions such as the judicial system, constitutional rule, selection of political leadership and organization of political coalitions. If the constitutional provisions for polycentricity in any of these spheres was incomplete, polycentricity would not emerge or be maintainable because the tendency for evolutionary self-correction and self-regulation would be disturbed (V. Ostrom, Tiebout, and Warren 1961; van Zeben 2013). Further, important underlying meta-

constitutional rules are incentives that make members of a society enforce general rules which frame the polycentric order.

Table 1: Categories derived from the normative theory of polycentricity to characterize the polity

Meta-norms
Incentives for all members of a society to enforce general rules that frame the polycentric order.
Availability of the conditions to formulate and revise basic rules of conduct in the polycentric system.
Knowledge and reliability of societal rules, as well as access to knowledge about alternative rules and their outcomes.
Normative orientations, where constitutional laws are violated, citizens must be willing to exercise civil disobedience.
Legal and constitutional framework
<i>Market sphere</i>
Secure property rights and market orders (contract law, in the terms of Williamson 1985) that sanction contractual agreements.
<i>Judicial sphere</i>
Legal concepts and terms must be knowable, public, and intersubjectively applicable. Operable basis for judgment and principles for legal reasoning must be laid out. Interpretation of law must be subject to “contention among autonomous colleagues who are learned in the law” (Ostrom et al., 1961, p. 62).
<i>Political sphere</i>
Party system allows emergence of political entrepreneurs and provide incentives to reformers of party politics.
Need for a culture of learning and entrepreneurship among political actors.
Election laws need to be intact and existence of multiple constitutional decision rules in relation to selection of different actors.
<i>Constitution</i>
Independence of diverse decision-making units is upheld. Constitutional changes subject to extraordinary decision-making procedures.
Decision-making capabilities are assigned among diverse decision structures of a government with independence of other decision structures.
Concurrent regimes with overlapping jurisdictions must exist and constitutional limitations must be imposed upon governmental authorities.
Limits to polycentricity in the organization of government and any society depend upon the services of some oligarchy to exercise ultimate authority.

Source: own, based on Ostrom, Tiebout, and Warren 1961; van Zeben 2013; Aligica and Tarko 2012; McGinnis 2005

4.2 Positive polycentricity theory and the polycentricity framework

Positive polycentricity theory is based on the normative theory as described above. It posits specific causes that help to explain governance structures, actors’ behavior and performance of governance. It sets out to empirically test the claims normative polycentricity theory makes. Examining the complex interrelations that normative polycentricity theory posits is

challenging. Thus, only few aspects have been addressed so far. The Ostroms themselves set out to test this theory in the sixties and seventies through work on local public economies, metropolitan governance and, more specifically, policing (cf. Parks and Oakerson 2000).

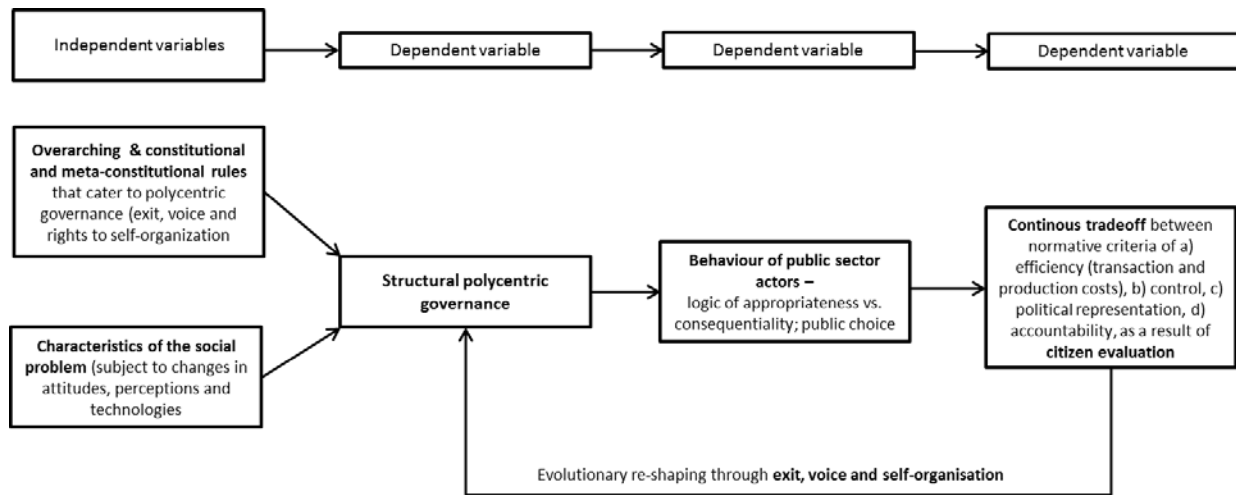
The most prominent outflow of the research program on polycentric governance is the work concerning local collective action in the context of common pool resource management. It started to address the behavioral dimension only after the first publications on polycentric governance. Ostrom (1999c, 124) specifies: “[T]he critical variables [to understand behavior] of concern to scholars in the polycentric tradition include (1) individuals; (2) decision rules; (3) sets of events; (4) outcomes; and (5) measures of performance.” Openness with regards to motivations and behavior is also expressed by V. Ostrom (1999c, 125) ⁴ in claiming that “[o]nce we can conceptualize how individuals will choose strategies in light of the opportunities available to them in differently structured events with reference to different sets of decision rules, we can begin to specify the consequences for each set of permutations. We then have the necessary foundation for specifying the behavioral characteristics for aggregations of individuals who are organized into different types of collectivities.” There can be little doubt that later development and work on the behavioral dimensions of the IAD followed from this kind of reasoning. The theory underlying the IAD (which itself is not theories but a framework) relates to assumptions of purposive actors, their capacity to restructure institutions and methodological individualism. As a result, the behavioral dimension is included into the polycentricity framework (figure 1). Work on the IAD leads to the identification of design principles and further factors influencing collective action in local common pool resource settings (Ostrom 1990; 2005; 2007). Nevertheless, with its focus on local CPRs and mentioning polycentricity only in passing, for example through the design principle of nested institutions, it can be considered an operationalization of polycentricity for local common pool resources. On the whole, polycentricity opens up further research avenues. The resultant research program comprised of polycentricity addresses vertically and horizontally interlinked, autonomous but interrelated actors (Schoon, Robards, Meek and Galaz, 2015). Coupled with the conditions underlying the emergence of polycentric governance and its implications for performance of governance, a rich additional research agenda emerges (see figure 1). It is captured through the overall polycentricity approach, as depicted in figure 1. This consists of a normative and a positive theory underpinning the analysis of polycentric governance and in itself embodies an analytical framework that aims at corroborating either theory.

To summarize this section functionalist, polycentric governance in this paper is conceptualized as a static structural description of governance. It is embedded in the polycentricity approach which highlights the foundational causes and normative preconditions for polycentric governance to emerge and the performance features that make it desirable (normative polycentricity theory), and the explanatory dimensions of (polycentric) governance (positive polycentricity theory). As neither the normative nor the

⁴ Initially published 1972.

positive theory have been sufficiently corroborated by empirical studies, the elements that are part of polycentricity theory are suggested as components of an analytical framework guiding future research. In what follows, we review how, over the last 15 years of research, the term polycentric governance has been used in the literature and what the principal findings were.

Figure 1: The polycentricity approach entailing a normative and a positive theory and an analytical framework embedding polycentric governance



Source: own, after Ostrom 1999c; Ostrom, Tiebout, and Warren 1961; Ostrom 1999b; McGinnis 2005

5 Mapping the last fifteen years of research on environmental governance and its relation to the polycentricity approach

In the following, I revisit published work that relates to the polycentricity approach. Particularly, I selected work that makes use of the terms polycentricity or polycentric governance in studies on environmental governance. Articles have been sought through Web of Knowledge and Scopus for title, abstract or keywords, covering the years 1999 to 2014. I selected 74 papers, most of which focus on theoretical elaboration or metropolitan governance. Twenty five papers actually address environmental governance and relate it to the terms polycentricity or polycentric governance.

Articles that explicitly related to environmental governance were reviewed applying a loose meta-analysis. The review was structured with reference to the “conceptual instruments” of social science research introduced above. Hence, the question was, whether and how work related to polycentricity or the polycentric governance concept - as theory or as framework. At the same time, I evaluated the outcomes of research in relation to polycentric governance and identified some gaps.

5.1 Polycentric governance as ontological, operationalizing and sensitizing concept

The majority of the papers reviewed rely on polycentric governance as a background concept, based on the same ontological presumptions concerning the way relations within

society are ordered as done by the polycentricity approach. Ontological acceptance of polycentric ordering of societal relations comes along with the recognition of the impossibility to do justice to the concomitant complexity in empirical research. Therefore, papers focus on particular aspects of polycentricity. In relation to the above-described ways of engaging with concepts, could be described as an ontological and sensitizing use of the concept of polycentricity.

Heikkila and colleagues (2011) address the role of specific types of cross-scale or cross-level linkages between two or more actors in transboundary watershed management. Nagendra and Ostrom (2012) similarly address the interaction between actors at different levels of governance. They look at variation in management of forests. Marshall (2009) couches his analysis of conservation within the notion of polycentricity when he analyzes relations between communities of farmers and public agencies at lower levels. Basurto (2013) studies how multi-level institutional linkages (for example employment, membership, or different kinds of partnership) affect processes of local institutional change, such as emergence or robustness. Galaz and colleagues (2012) analyze marine governance. They specifically aim to conceptualize and uncover the content of relations in polycentric orders of governance in the international realm.

In addition to an ontological and sensitizing use of the concept of polycentricity, some of the above papers extend use of the concept in an operationalizing fashion. Andersson and Ostrom (2008) operationalized vertical interlinkages of three types: frequency of interaction between local resource users and local governments, financial transfers between central and local governments, and upward political pressure for explaining commitment of local actors to invest into the governance of natural resources. Their results corroborate that a polycentric approach that enhances interactions and cross-level incentives between actors is an important determinant of local government interest in natural resource governance. Political as well as financial incentives seem to be of relevance in this regard. Heikkila and colleagues (2011) operationalize types of functional interlinkages in polycentric governance relying on Ostrom's design principles. The resulting categorization shows similarities with what the Ostroms called governance functions (Ostrom, Tiebout, and Warren 1961; McGinnis 2011). They count occurrence of types of horizontal interlinkages and their relevance to governance functions and kinds of institutions (constitutional, collective choice, operational). They qualify the corresponding results by discussing relative importance of specific types of linkages, such as allocation, collective choice and monitoring rules. Sarker and colleagues (2014) do not explicitly address polycentricity but argue for an inclusion of state actors, multiple modes of governance and divergent policies into IAD analysis at the local level. Thus, they extend the IAD in conformance with the ontology of polycentricity. Galaz and colleagues (2012) address polycentricity from a network perspective. They characterize connections between actors at the international level through their degree of communication, formalization and network structures. For the international realm they highlight that connections are not only to serve coordination between actors but also to enable political influence.

To summarize this section, we can say that polycentric governance is mostly used as a concept to frame and sensitize research. Along with such use goes the analysts' subscription to its ontological presumptions (variability of social problems and concomitant governance structures, heterogeneity of social collectives). Where analysts directly research polycentric governance, they predominantly address different types of horizontal and vertical interlinkages between actors intervening in governance. Where the performance of polycentric governance is evaluated, the concept is operationalized and specifically tested with regard to the adaptive capacity and flexibility of corresponding governance structures.

5.2 Polycentric governance as positive, explanatory or normative, value-laden theory

In this section, we will first look at publications that employed versions of what we call the polycentricity approach as positive, explanatory theories before we look at authors that employed it as normative, value-laden point of reference for evaluating the performance of environmental governance. Authors that employ polycentricity as positive theory usually explain governance without being very explicit about the causal relationships at play. Schlager and Blomquist (2008), for example, observe polycentric governance. They see it as result of overlapping arrangements where on the one hand, management units whose boundaries have been drawn in a technocratic manner are coupled with emerging forms of representation on the other in which communities invest into additional fora to articulate and protect their values and interests. Thiel (2013; forthcoming; Thiel and Egerton 2011) explains how constitutional state structures, as expressed in different roles of subnational units in either federal or unitary states, shape governance of marine resources and watersheds. Other authors couple the explanatory clout of theories they associate with polycentricity with critical approaches. Gruby and Basurto (2014) discuss the usefulness of complementing the polycentricity approach with approaches derived from critical human geography that address the politics of scale. Armitage's work (2008) approaches polycentricity in a similar way and discusses the way normative principles derived from work on the commons and resilient governance become eventually operationalized in multi-level contexts of environmental governance ridden by power, discourses and diversity of knowledge about valuations and distributional implications. A similar conceptual ambition has been expressed by the work of Clement (2013).

Examples of an application of normative polycentricity theory are claims about the role of polycentric governance for adaptive management, resilience and robustness (Anderies, Janssen, and Ostrom 2004). Pahl-Wostl (2008, 1) define adaptive management as "a systematic process for improving management policies and practices by learning from the outcomes of implemented management strategies" (cf. Folke et al. 2005, 447). The underlying normative assumption is that polycentric governance allows for flexible coping with external drivers and that rapid change is enhanced by systems of governance that exist at multiple levels with some degree of autonomy, complemented by modest overlaps in authority and capability" (Folke et al. 2005, 460). Nagendra and Ostrom (2012, 115) go further in their normative claims when they write that "polycentric governance tends to reduce opportunistic behavior in forested and urban settings because the complexity of

many natural resources requires sophisticated multitier or polycentric governance systems rather than a reliance on a single type of level of governance” (McGinnis 1999, quoted by Nagendra and Ostrom 2012). Ostrom becomes even more explicit about the virtues of polycentric governance when she discusses climate mitigation. She states polycentric governance “tend[s] to enhance innovation, learning, adaptation, trustworthiness, levels of cooperation of participants and the achievement of more effective, equitable, and sustainable outcomes at multiple scales...” (2010c, 511; cf. Rayner and Jordan 2013; Sovacool 2011; da Silveira and Richards 2013). It helps to overcome opportunistic behavior, enhances face-to-face communication, and matching of ecosystem, institutional and social scales. Other authors raise claims that polycentric governance is more robust (Anderies and Janssen 2013), resilient (Garmestani and Benson 2013) and less vulnerable because of high degrees of overlaps and redundancy (Gupta et al. 2010).

Sensitized by the normative propositions on polycentricity some authors try to measure the performance of governance that varies in relation to the degree of polycentricity. Da Silveira and Richards (2013), for example, look at what aspects of polycentricity make it beneficial to adaptive capacity. For the cases of the Rhine (Europe) and Pearl River (China) these authors conclude that internal power dynamics, competitive and collaborative patterns of interaction between multiple centers and emergence of functional and operational linkages among them are key to explain adaptive capacity. Similarly, Pahl-Wostl and Knieper (2014) examine the causal proposition that polycentricity renders governance more flexible and adaptive. From a QCA-based multiple comparative case study they conclude that polycentric governance regimes are more responsive to climate change than other, centralized or even fragmented types of governance arrangements and they, furthermore, discuss the role of external conditions such as economic performance for adaptive capacity. Often polycentricity is equated with the design principle of nested institutions (Huntjens et al. 2012; Heikkila, Schlager, and Davis 2011) among Ostrom’s eight design principles (Ostrom 2007). Corroborating such ideas, in their examination of adaptive capacity of watershed management in relation to climate change, Huntjens and colleagues (2012) found that adaptation to climate change relies on polycentric institutions which they consider crucial.

Nevertheless, while the literature concludes with the many virtues of polycentric governance, also some drawbacks are mentioned. Thus, it is argued that distribution of governance functions across multiple decision-making centers decreases possibilities to realize economies of scale and scope in governance, making polycentric governance subject to high transaction costs (cf. McGinnis, 2005). Schoon et al (Schoon, Robards, Meek and Galaz, 2015) equate this with the need to balance redundancy and experimentation with concomitant inefficiencies and heightened transaction costs. Similarly, loss of democratic accountability of governance is expected not least because of the complexity of decision-making processes (Lieberman, 2011), which may lead to advantages of powerful actors that manage to navigate the complexities of polycentric governance successfully. Furthermore, polycentric governance focusses on static structures of governance without giving much emphasis to the way they are enacted. The latter, however, may be decisive for performance

of governance (Schoon, Robards, Meek and Galaz, 2015). More fundamental, systemic critique is raised by Harvey (2010) who wonders about the way polycentric governance would address questions of redistribution.

5.3 Polycentric governance as analytical framework

In the ontological and sensitizing tradition of the use of concepts, polycentricity has been used as an implicit framework in all above-cited studies. While Gruby and Basurto (2014, 50) explicitly referred to polycentricity as a “framework for analysis”, they did not spell out what the elements of such a framework would be. As a matter of fact, different frames of reference have been devised for analyzing aspects of polycentric governance, without precisely showing how these relate to the overarching polycentricity theory and framework, which this paper derived from the theoretical writings on the subject. Also, the IAD can be considered to be a framework analyzing particularly self-organisation at the local level, a key component of polycentric governance. Similarly, Lubell situates his work on the Ecology of Games in-between a framework and a positive theory inspired by and consistent with polycentricity and the IAD framework (Lubell 2013; Lubell, Henry, and McCoy 2010). He writes “the EG [Ecology of Games] framework intends to produce empirically testable hypotheses about structure and function of complex adaptive governance systems, analyze the causal processes driving individual behavior and institutional change and ultimately understand how different types of institutional arrangements are linked to policy outputs and outcomes...” (Lubell 2013, 513). It considers the role of cooperation, distribution and learning processes in governance which involve “multiple policy games operating simultaneously within a geographically defined policy arena, where a policy game consists of a set of policy actors participating in a rule-governed, collective decision making process” (Lubell 2013, 538). Applications of the EG approach (Lubell, Henry, and McCoy 2010; Smaldino and Lubell 2011; Lubell, Robins, and Wang 2011; Berardo and Scholz 2010) focus on conceptualizing the internal workings and determinants of interdependent but autonomous actor constellations.

Further, the Network’s of Adjacent Action Situations (NAAS) approach, developed by McGinnis (2011) seeks to connect analyses of specific policy games or action situations using the IAD to the complexity within which they are situated from the perspective of polycentricity. It goes beyond the EG approach by referring to the dynamics between different levels of institutional analysis and governance functions and raises interest in the connections between the focal action situation and its context (McGinnis 2011, 58). However, this also begs the question of when we can call action situations adjacent. From the perspective of polycentricity this concerns the delineation of the public sector industry (Ostrom and Ostrom 1999a). McGinnis suggests reliance on the perspective of the agents involved in this regard. McGinnis himself illustrates how the approach helps to focus on key processes that determine outcomes. A first operationalization and detailing of linkages and their roles for focal action situations has been provided by Kimmich (2013) who studied the NAAS established by the role of energy (and its governance) for irrigation in Andhra Pradesh, India.

The frameworks discussed seem to confirm the focus of above cited studies inspired by an ontological understanding of polycentricity that focusses on cross-scalar and horizontal interlinkages between actors. They emphasize particular elements that establish structural, static polycentricity. In what follows, I want to further develop the notion of polycentricity as analytical framework. The purpose is to identify conceptual, methodological and knowledge gaps in research whose elaboration promises useful to expand and in that way deepen our understanding of environmental governance.

On the whole, summarizing this section, we can observe that work on the use of polycentric governance for explaining change of institutions and governance relates to processes and channels of deliberation that actors have at their disposal in order to express their preferences. However, relatively little work has been done concerning which kinds of processes lead to polycentric governance in this regard and of what nature underlying conditions have. Value-driven (normative) statements about polycentric governance are abundant in the literature. Many have neither been substantiated for specific case studies nor on a more general level (Huiteima et al. 2009; Anderies and Janssen 2013). Careful work in this regard is highly challenging. It highlights the need for an operationalization of types of polycentric governance which allows measuring performance (Schoon, Robards, Meek and Galaz, 2015). Disentangling causalities is specifically complex because of the comprehensiveness of Vincent Ostrom's suggestions of what polycentric governance builds on and entails. However, in order to build a comprehensive research program, in this paper it is considered useful to view polycentric governance as a meta-analytical, highly abstract analytical framework that helps to connect theories and analytical frameworks that subscribe to related core assumptions .

6 Discussion and conclusions: developing research based on an understanding of polycentric governance as analytical framework

With regard to conceptual advances, the differentiation of structural polycentric governance has been developed furthest, specifically in respect of horizontal and vertical interlinkages. This becomes specifically clear when we look at the various conceptualizations of polycentricity as networks and interconnected games.

Empirical knowledge creation and operationalization focuses on the way a polycentric ordering of public service entities influences the performance of overall governance. Research on co-management and co-production (Verschuere, Brandsen, and Pestoff 2012), the Ecology of Games (Lubell 2013, 513), Institutional Collective Action (Feiock 2013) and the Network of Adjacent Action Situations (NAAS) illustrate ongoing developments in this field. Nevertheless, these significant advances, with regard to the study of the polycentric governance structures, require further differentiation as also confirmed by above-mentioned authors working on this understanding of polycentricity.

When we consider the broader polycentricity framework (figure 1) in order to identify research needs, we diagnose important research gaps in relation to the above-described

foundational elements of polycentricity: 1. constitutional rules, and 2. characteristics of social problems. With regard to constitutional rules, this refers to the operationalization of constitutionally catered opportunities regarding voice, exist and self-organization, and overarching rules within which polycentric governance is to develop. Focusing on a) operationalizing constitutional and meta-constitutional rules underlying polycentric governance as well as b) spelling out their effects in specific constellations, both offer an exciting agenda for the study of (natural resource) governance.

The relevance of such research becomes clear when we reflect on numerous comparative case studies of natural resource governance that include countries whose underlying constitutions largely differ. Illustrative in this regard is the study by da Silveira and Richards (2013) who discuss polycentricity of water governance in the cases of China and the EU. Questions also relate to studies that discuss polycentricity in international marine and natural resource governance (Gruby and Basurto 2014). At the very least, the question emerges how we should further develop and operationalize the constitutional conditions suggested by Vincent Ostrom over 40 years ago. For example, where formal rules significantly differ from the initial, normative propositions of the Ostroms, but where we can still observe polycentric, functional operation of governance, certain kinds of meta-constitutional, informal rules may lead to polycentric governance.

Furthermore, as regards overarching rules within which polycentric governance is supposed to develop, the question emerges what aspects and governance functions need to be regulated at the overarching level in a non-polycentric way, and what aspects can be organized in a polycentric fashion. For example, Hooghe and Marks (2004) seem to suggest that distributional tasks and provision of public goods should be taken up by overarching levels. This also highlights that more research needs to be invested in the role of characteristics of social problems for potentials of polycentric governance in order to evaluate this question. As a matter of fact, the characteristics of social problems are hardly addressed in research on natural resource governance. Research on local common pool resource management that has been developed by the Ostrom School has pointed out for long that the characteristics of resource systems and units largely differ and lead to a differentiated way in which they are addressed (Schlager and Blomquist 2008; Schlager, Blomquist, and Tang 1994; Hagedorn, Arzt, and Peters 2002; Agrawal 2001; Ostrom 2009). Recently, this agenda has been detailed by institutional economists that transposed transaction cost economics to the analysis of what can be called nature-related transactions (Hagedorn 2008, see also Bougherara, Grolleau, and Mzoughi 2005; McCann 2013). Previous research addressed the role of characteristics of social problems such as mobility (Schlager and Ostrom 1992; Thiel, Schleyer, and Plieninger 2012), jointness (Falconer 2002), care intensity (Birner and Wittmer 2004) and the like. However, their impact on polycentric governance has not been addressed in a systematic fashion yet.

Moving on along the polycentricity framework it becomes clear that, similarly, the link between polycentric governance structures and behavior of (public) agents has hardly been

addressed thus far. However, reading Skelcher (2005) and going back to the Ostroms (1999c) illustrates the relevance of such work. According to Skelcher (2005), the normative theory of polycentricity aims to introduce the behavioral logic of consequentiality into provision of public goods and services. It entails that “action arises from a calculation of expectations in relation to preferences” (Skelcher 2005, 102). Bureaucrats’ preferences may be related to policy output or outcomes in relation to a welfarist, societal perspective, or they may be directed at personal gain (Niskanen 1994; Mueller 2003). In contrast, specifically in the public sector, many analysts consider the logic of appropriateness to dominate, i.e. behavior that is oriented by rules, roles and tasks, rather than by outcomes (March and Olsen 1989; 2004; Cohen, Olsen, and March 1972). Skelcher continues to write that “[t]he design of governance institutions for collective decisions in a polycentric environment needs to accommodate this tension” (Skelcher 2005, 102). He sees it as a result of the co-existence of general purpose and problem-oriented, specific purpose administrations within polycentric systems that, for functional reasons, need to relate to each other. Thus, also in polycentric systems it becomes necessary to balance the general interest reflected in administrative rule-following which is not contestable by individual consumers or members with interests of efficient provision articulated by purpose-oriented jurisdictions where under- or overprovision can be punished. Corresponding governance structures need “to be able to resolve collective action problems, to reflect and protect particular interest as well as the general will and not to necessitate a hierarchical equivalence of spatially defined jurisdictions” (Skelcher 2005, 104). As becomes evident from this elaboration, a rich research agenda couched in the polycentricity framework may address the way governance structures and their underlying foundations shape behavior of actors involved in governance. Such work could be developed through behavioral economic approaches which examine the behavioral effects of typologies of polycentric governance structures.

Another research focus that the polycentricity framework points at and that has already been alluded to above concerns the performance of polycentric governance structures in relation to specific performance criteria. This becomes important because a multitude of new, sustainability-related performance criteria have been introduced such as robustness, resilience, flexibility, or vulnerability. The corresponding causal relations are theoretically and empirically unclear (cf. Anderies and Janssen 2013; Lubell 2013; Huitema et al. 2009). Detailed research on the effects of polycentric governance on each of them is missing thus far.

Finally, I would suggest that we can also use normative polycentricity theory as a framework for focusing on causal relations between aggregate aspects. Hence, an interesting question concerns the role of specific sets of constitutional and meta-constitutional rules (e.g. varieties of capitalism) for innovative performance criteria concerning social-ecological systems such as, for example, resilience or robustness, or for the behavioral dimension of polycentric governance.

7 Summary

In this paper, I have re-visited the original writings of the Ostroms on functionalist, polycentric governance and ordered them in relation to social scientific tools of research such as ontological, operationalizing and sensitizing concepts, as normative and positive theories, and as conceptual framework providing innovative outlooks on research. Based on the original normative theory of polycentricity, I suggest to understand polycentric governance as a research framework (or lens) on environmental governance which aims at providing a coherent understanding of the ontological and normative conditions underlying polycentricity and their implications for behavior of public service providers, and categories such as transactions costs, user satisfaction, efficiency or even resilience. A review of the literature on environmental governance that relates to polycentric governance proved that a distinction of the ways the term polycentricity is used helps to structure and interrelate research work related to polycentric governance. Further, understanding polycentric governance as an overarching analytical framework led to the identification of several research gaps: the operationalization and differentiation of a structural understanding of polycentric governance, the role of constitutional and meta-constitutional rules and social problem characteristics for polycentric governance, ways to distinguish the domain of overarching rules and the domain of polycentric governance, the way polycentric governance shapes agents' behavior in acts of public service provision, and the relation between constitutional rules, polycentric governance structures and innovative criteria to evaluate social-ecological system performance. In the context of this assessment, recently renewed interest in polycentricity of environmental governance is welcome and promises exciting research.

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