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Polycentric Climate Governance: The State, Local Action, Democratic Preferences, and Power—Emerging Insights and a Research Agenda

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Abstract

In recent years, climate governance has shifted from the global, multilateral regime to voluntary initiatives from multiple directions. Scholars frequently use a polycentric governance lens to study the complex and multijurisdictional reality. The polycentric perspective helps to grasp the new reality at a general level, but it is lacking in specificity. To fill this research gap, this article attempts to enhance the analytical power of the polycentric governance perspective by exploring four issues: the role of the state, diffusion of local action, integration of local democratic preferences, and the role of power. These issues are discussed by doing a systematic literature review of empirical polycentric governance literature regarding climate change mitigation. The results show the importance of states at the national level and provide insights into how local initiatives share and transfer knowledge, get supported by transnational networks, and secure compliance with local democratic preferences. The literature provides less insight into the role of power. The article concludes by developing research agendas for further cumulation of knowledge and to strengthen climate action at all levels.

Keywords: climate change, climate mitigation, literature review, polycentric governance, climate initiatives

Since the signing of the Kyoto Protocol, the landscape of global climate policy has been constantly in flux. This landscape has grown more complex since then, particularly following the 2015 United Nations Conference of the Parties in Paris. Climate action can come from all corners of society, and burden sharing at the global level has become less of an ambition (Betsill et al. 2015; Jordan et al. 2018). In consequence, the global climate governance regime has many constituting actors and units. Different terms are used to describe the result, with some authors focusing on the interactions between various modes of

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governance (Green 2014), others highlighting the experimentalist element of the emerging constellation (Sabel and Zeitlin 2008), and yet others suggesting that the climate governance regime has become complex (Bernstein and Cashore 2012) or fragmented (Zelli and van Asselt 2013).

Ostrom (2009) offered a novel and rather encompassing view when she suggested that the global climate landscape might best be approached from the lens of *polycentric governance*. As also cited in the introduction to this special issue, “polycentric systems are characterized by multiple governing authorities at different scales rather than a monocentric unit. Each unit within a polycentric system exercises considerable independence to make norms and rules within a specific domain” (Ostrom 2010, 552). Ostrom’s contribution to climate governance drew a lot of attention because it turned some of the elements of the pre-existing consensus on their head. She highlighted the advantages of a regime that no longer revolved around centralized and global coordination of emission targets but rather revolved around voluntary initiatives and spontaneous action from multiple directions and concomitant self-organizing forms of coordination. Specifically, Ostrom suggested greater levels of learning, innovation, collaboration, and (positive) competition occurring in polycentric systems, so that eventually, higher levels of effectiveness would ensue. She also pointed out that this lens requires further conceptual and empirical underpinnings. This has inspired many scholars to study the prospects of polycentric climate governance. The aim of this article is to provide a targeted systematic literature review examining empirical studies of climate change mitigation that use a polycentric governance perspective to enhance our understanding of the mechanisms and processes of polycentric climate governance.

Before focusing on mechanisms and processes, we want to point out that a recurring question is what exactly is polycentric versus monocentric. Van Asselt and Zelli (2018), for instance, suggest that calling the “pre-Paris” approach to global climate governance was hardly as “monocentric” (directive or centralized) as it is sometimes made out to be. In a similar vein, Setzer and Nachmany (2018) suggest that most nation-states are polycentric entities too—as evidenced, for example, by the large role that municipalities and cities (part of the fabric of the state) play in climate governance. Aligica and Tarko (2012) grasp polycentricity as a matter of degree. Therefore, understanding polycentric governance requires a scale of polycentricity, which they subsequently delivered, using Ostrom’s earlier work on rule types, suggesting how various rule settings connect to varying degrees of polycentricity. This helps to structure studies that use polycentric governance as the independent variable.

Jordan and colleagues (2018) pursued for several years a research agenda into the prospects of polycentric climate governance, for example, by looking explicitly at the capacity of polycentric governance regimes to develop novel policy approaches. They identified five key propositions on polycentric governance, notably, local action, self-organization, mutual adjustment, experimentation, trust building, and activation of overarching rules. The presented

empirical analyses of processes of policy innovation confirm the importance of interactions between various levels and types of actors in the climate regime, specifically between transnational actors and the international regime, but also between transnational actors and national policies. Jordan et al. (2018) observe extensive experimentation with new governance approaches. However, mutual adjustment between emerging initiatives takes place not only through collaboration and collective learning but also through competition and attempts at replacement. This leads to questions of power between the units in polycentric systems. Morrison et al. (2019) subsequently pointed to the fact that discussions on polycentric governance tend to overlook the importance of power in decision-making in polycentric systems.

Another important aspect of polycentric governance processes is feedback mechanisms. A recent literature review on polycentric governance by Baldwin et al. (2023) suggests that the current literature lacks insights on feedback pathways and adjustment mechanisms by which polycentric governance evolves over time. They also present that polycentric governance thinking does not offer many tools with which to analyze the contextual conditions for the functioning of polycentric governance systems. Connecting to this insight, Petrovics et al. (2022) assess the degree to which polycentric governance thinking delivers the analytical tools to understand how initiatives overcome collective action problems, how they interact with other initiatives to form networks and learn from each other, and how their institutional environment affects their functioning. They focus in their study on the way energy collectives can play a catalytic role in energy transitions. They conclude that the polycentric governance lens helps to understand the role of communities in energy transitions, but there are some conceptual gaps to capturing all dynamics implied within, between, and around initiatives.

Priority Issues for Further Insight

The overview shows that the debate about polycentric governance is maturing with more elaboration of assumed causal relationships and an increasing level of empirical evidence to understand the functioning of polycentric governance. However, the literature is still relatively fragmented. For instance, the scale of polycentricity as developed by Aligica and Tarko (2012) is little used in any of the follow-up publications, whereas the actual degree of polycentricity is a matter of institutional design and thus a realm where power is exercised, according to Morrison et al. (2019). Moreover, the proposed five propositions by Jordan et al. (2018) are only rarely proven in subsequent studies (except, e.g., Kellner et al. 2019). Even though Ostrom suggested studying feedback pathways and adjustment mechanisms several years ago (Ostrom 2009), the review by Baldwin et al. (2023) indicates that there is still a gap in the literature on this topic. This suggests that there is a need for a systematic stocktake of the literature to further advance our understanding of specific issues. There are several key

issues to choose from, such as performance of polycentric climate governance, multilevel interaction between the units, or the role of private authority in polycentric systems. However, having the current literature and discourse in polycentric governance in mind, and after a brief review of all empirical polycentric climate governance articles on climate mitigation, we choose to deepen the analysis of the empirical studies on the following four priority issues: the role of the state, the mechanisms through which local action diffuses, the balance between local democratic preferences and the tendency toward evidence-based policymaking, and the role of power. Our decision is based also on the conviction that “community” initiatives play an important role in polycentric climate governance and therefore need more attention. However, other activities, such as business initiatives, also play an important role in climate change mitigation and are, for example, a focus of Tobin et al. (2024). We discuss each of these issues in the following sections.

The Role of the State

Given its background in discussions about the provision of services by local government in the United States (Ostrom et al. 1961), it is slightly idiosyncratic how polycentric governance thinking is now equated with local action by communities and their subsequent interactions. In fact, state action is often presented as the logical opposite of polycentric governance, as it is defined as a monocentric form of governance (Huitema et al. 2009). This clouds the view of the state in various ways. It ignores the fact that nation-states are composed of multiple layers and elements themselves (municipalities, provinces, national governments, ministries, agencies) and are thus also polycentric actors (Setzer and Nachmany 2018). This means, for instance, that climate action taken at the city level, or action from the courts—whether to compensate for or resolve inaction at the national level—should be read simultaneously as a demonstration of polycentricity and state action.

Second, as Jordan et al. (2018) observe, there is a strong interaction between state action and the abilities and propensity of local communities to become active. States inherently engage with nonstate actors, enabling them to either support or regulate various activities, fostering self-governing initiatives or curbing undesirable behavior. Moreover, states create the institutional structure for action at the local, national, and international levels. In addition, states tend to maintain the rule of law, which is seen as essential for the proper and balanced functioning of a polycentric governance system. Last, recent arguments highlight the state’s role as an entrepreneurial actor, capable of not only addressing market imperfections and externalities but also creating markets, particularly for sustainable technologies. The state uniquely possesses the authority and resources to set goals, allocate resources, and take risks to promote technological advancements (Mazzucato 2021).

Diffusing Local Action

Can we indeed expect a catalytic effect (Bernstein and Hoffmann 2018) from community initiatives, and if so, how? More analytical insights are needed into the ways various fragmented local initiatives address climate change mitigation and contribute to resolving higher-order dilemmas by working at the local scale, for example, how community-based initiatives expand, deepen, and find the right scale, but also how communities collaborate. Communities that work together are aware of the impact that their actions have on others, learn from each other, and are open to feedback from others (Petrovics et al. 2022). But how this kind of self-organization works, and which mechanisms are implied, is relatively unclear. Does self-organization mean that a government does not need to organize? Can public authorities both aid initiatives (financially, for example) and also abstain from the process, yet still produce successful initiatives (Petrovics et al. 2024)? From the perspective of communities themselves, this is likely to require a lot of work, and networks play a large role in how effective some are.

Local Democratic Preferences and Evidence-Based Policymaking

There is a significant tension between local democratic decision-making and the notion that local initiatives act as natural experiments. The initiatives' diversity allows experts to evaluate them, as Ostrom (2009) suggested, to identify best practices. Ostrom was optimistic about drawing lessons and systematizing insights into the efficacy of various policy approaches, thereby enhancing our understanding of effective governance. This reinforces the impression that, despite the focus on initiatives at various levels and their co-benefits in overcoming collective action challenges, the main notion is to monitor and to "compare the effectiveness of diverse strategies in different units" (Ostrom 2009, 16). To do this, skilled experts are needed to certify that projects reducing greenhouse gas emissions effectively lower CO₂ levels. However, we do know from the literature that actors involved in different governance levels may have different preferences for climate action (Biedenkopf 2017). Therefore, it is important to better understand how local initiatives are able to acknowledge local democratic preferences and evidence-based policymaking (Schoenefeld and Jordan 2017).

The Role of Power

Power has been mostly ignored in the debates on polycentric governance. However, it is assumed that "the rule of law" exists and provides an equal frame for all, operating within and between communities. The rule of law must be provided and enforced, which can mostly only be legitimately done by states and the courts they institutionalize. Which principles are embedded in the rule of law might differ tremendously per community or jurisdiction. This means that

whoever “designs” these principles is in a significant position of power. Likewise, political preferences of communities are not always endogenous, uniform, and a given. It is likely that the forming of such preferences is influenced by the active attempts to frame issues and potential solutions and that whoever is most adept at framing might thus also hold sway over communities.

Moreover, few communities do not delegate power to representatives, or officials, which means that the actual implementation of community decisions is also a choice, and in some cases, nonimplementation might ensue. This may be an even bigger problem in agreements between communities, especially if agreements require adaptations from one community, while benefiting the other. So power, in its various forms, is likely to matter substantially in the ways polycentric governance emerges, develops, and performs. To categorize different types of power, Morrison et al. (2019) distinguish institutional design, pragmatic (implementation), and framing (agenda-setting) power. Morrison et al. presented various cases from around the globe where these forms of power could affect and advance polycentric governance productively or destructively block progress.

Systematic Literature Review: Process, Observations, and Limitations

Systematic Literature Review Process

A systematic literature review was conducted to identify all relevant empirical studies on polycentric climate governance and relevant literature reviews since 2015, the year of the adoption of the Paris Climate Agreement. To ensure the replicability of the review, we use the Reporting Standards for Systematic Evidence Syntheses in Environmental Research (ROSES) protocol for systematic reviews as a guide to reporting all steps in identifying and selecting relevant literature (Haddaway et al. 2018). Building on our own research experience in the field, we created a list of keywords to identify all relevant literature streams. Using the identified keywords, we conducted a keyword search in Scopus within the following search string: (“polycentric climate governance”) OR (“polycentricity” AND “climate governance”) OR (“polycentric governance” AND “climate”). The search was constrained to a specific period from 2015 and resulted in eighty-six relevant articles¹ (see Figure 1).

Next, we selected articles that could be empirical or conceptual with an empirical illustration and literature review. However, we excluded solely theoretical or conceptual contributions and articles that did not focus on polycentric governance in depth or address climate change mitigation. The selection was done initially by screening abstracts followed by screening the full text if the abstract was not sufficiently detailed for a determination. This resulted in a total

1. Last accessed May 20, 2023.

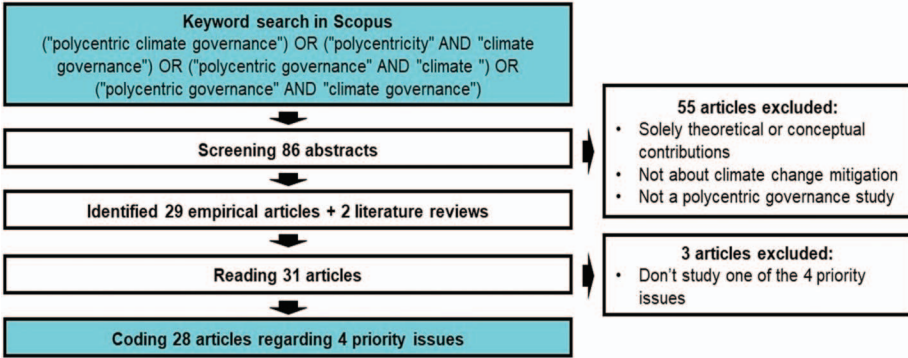


Figure 1
Systematic Literature Review Process

selection of thirty-one articles (Figure 2). During the coding process, three articles that did not contribute to one of our four priority issues were excluded (Online Appendix, Table 1). In relation to the objective of our article, we developed a codebook with three categories to get new insights about the four priority issues but also to collect some general information about the articles (Online Appendix, Table 2). The codebook includes a research question for each code of the four priority issues. The questions were developed based on the overview of each issue given in the preceding section. Next, we coded all twenty-eight articles regarding the four priority issues (Online Appendix, Table 3) and the general information.

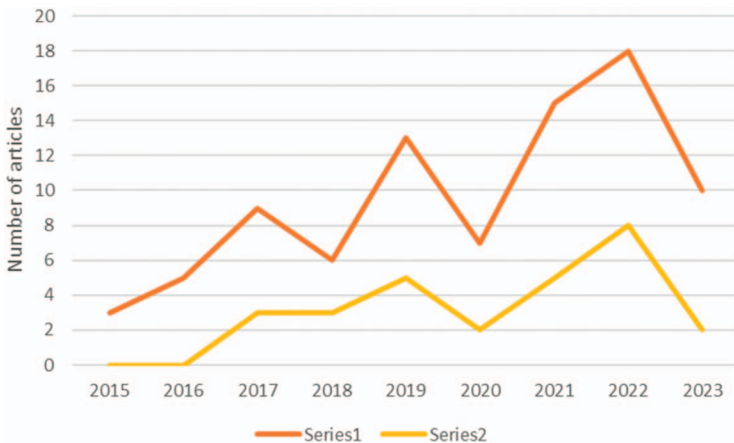


Figure 2
Number of New Publications per Year Identified by Search String 1 (Eighty-Six Analyzed Articles) and String 2 (Twenty-Eight Analyzed Articles)

The year 2023 was not completed at the time of the literature search.

Common Concepts, Empirical Context, Recurring Methods

The number of publications on polycentric climate governance has grown since 2015 (Figure 2). Nevertheless, the total remains relatively modest given the urgency to mitigate climate change (Intergovernmental Panel on Climate Change [IPCC] 2023) and the potentially global number of cases. Out of the eighty-six articles that matched our first search string (Figure 2, series 1), we selected the empirical articles and those that had an explicit focus on polycentric climate governance, climate change mitigation, and the four priority issues. This produced a subset of twenty-eight articles (Figure 2, series 2). The selected articles are published in nineteen different journals; the main journal, with four articles, is *Environmental Politics*, followed by *Environmental Policy and Governance* with three articles (Online Appendix, Table 4).

Most of the studies examine the national scale ($n = 7$), followed by transnational ($n = 6$) and multinational ($n = 5$) scales (Figure 3a). Surprisingly, no studies analyze the global scale. The multi- or transnational studies cover different countries or continents. However, most of the national, subnational, or local studies take place in Europe (Figure 3b). There is an obvious lack of studies on a variety of other continents. Due to our selection of empirical studies, the authors use mainly a comparative or multisite ($n = 11$) or a single case study design ($n = 10$) (Figure 3c). Main data sources were a mix of qualitative approaches, such as interviews, document analysis, and participatory observations (Figure 3d).

As can be seen in terms of higher-order contributions, most of the articles can be categorized along the lines of four key issue areas. The issue “role of the state” ($n = 12$), followed by “diffusing local action” ($n = 7$), “role of power” ($n = 5$), and local democratic preferences ($n = 4$) stand out. Some of the articles contribute to several topics, but we assign them only to the main issue area to which they contribute (Figure 3e).

Limitations of the Study

In this study, we examine empirical insights on polycentric climate governance. Therefore, our literature review considers only empirical studies or combinations with conceptual and theoretical contributions but not solely conceptual and theoretical articles. Furthermore, utilizing different governance perspectives for a similar analysis could provide more insights into key issue areas and may provide different conclusions. For some key issues, only a few studies exist. For example, in the case of the influence of supranational entities, we found only one article about the European Union (EU), one about the Association of Southeast Asian Nations Climate Resilience Network (ASEAN-CRN), and one about the Paris Climate Agreement. Next to this, 2015 was chosen as the cutoff point for the inclusion of our studies. Finally, we conducted a targeted review focused explicitly on polycentric climate governance.

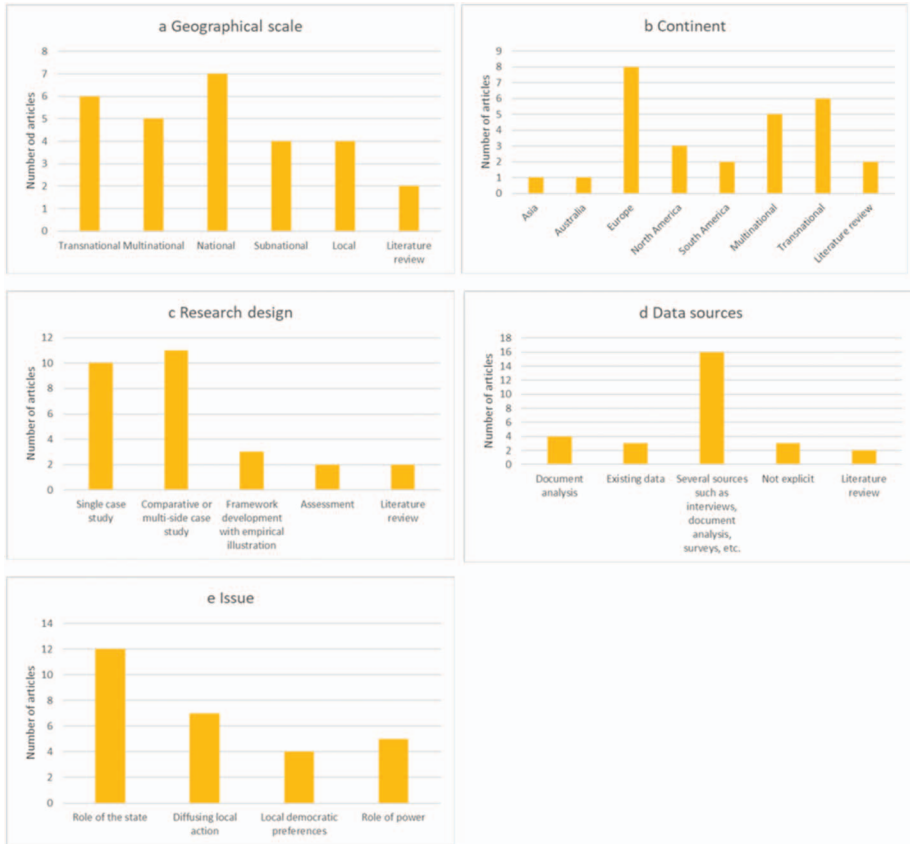


Figure 3

(a) Geographical Scale and (b) Continent of the Studies, (c) Research Design and (d) Data Sources Used in the Studies, and (e) the Number of Articles Assigned to the Four Priority Issues

Literature on networked governance, multilevel governance, or adaptive governance may provide additional insights that could also be relevant to polycentric governance thinking.

What Does the Systematic Literature Review Tell Us?

This section highlights key insights about polycentric climate governance thinking by presenting empirical issues through four distinct priority issues. We conclude each section by including identified research gaps and a research agenda for future polycentric governance studies. An overview of all coded articles is presented in the Online Appendix, Table 3.

Empirical Insights on the Role of the State

The literature provides insights at two different levels: first, states facilitating the emergence, operation, and scaling of local-scale initiatives and building their regulatory support framework and, second, supranational entities influencing climate governance at national, subnational, or local levels.

Several studies show how the state providing a regulatory framework is key for tackling climate change in polycentric governance systems. State leadership plays a crucial role in setting targets, establishing policy frameworks with incentives and sanctions for noncompliance, integrating a diversity of actors through interjurisdictional coordination, and steering programs and policies (Arriagada et al. 2018; Daley et al. 2024; Dupuis and Schweizer 2019; Furumo and Lambin 2021; Gillard et al. 2017; Sovacool and Martiskainen 2020). These activities facilitate agenda and ambition setting, tracking advancements, improving strategic planning, achieving a comparative advantage, and providing financial support for climate action (Arriagada et al. 2018; Wurzel et al. 2019). However, the collaboration of national and subnational actors at multiple political levels and centers can also result in unfavorable outcomes, such as policy blockage (Fisher and Leifeld 2019). What happens in polycentric systems when the state does not fulfill its role? Tuhkanen and Vulturius (2022) show how a lack of state activities, such as missing policy interventions, could lead to greenwashing and operations outside planetary boundaries.

Next to this, states can drive consistent policy development to sustain progress and achieve tangible milestones, such as yearly reductions in emissions. That means that states are goal and target setters and provide the orientation point for polycentric systems. Challenges arise when economic downturns occur or political priorities shift, leading to a slowdown in domestic progress and the emergence of an implementation gap. Such blockages can also impede policy innovation and the leadership potential of other actors, raising significant questions about the limitations imposed by governmental constraints on the influence of nonstate actors or governance arrangements (Gillard et al. 2017). Therefore, if public actors “invite other actors into the policymaking process at all stages and encourage autonomy in multiple sites of authority, there will be more room for experimentation, economies of scale and, ultimately, the progression of an inclusive low-carbon transition” (Gillard et al. 2017, 181). Similarly, Wurzel et al. (2019) suggest that it is also important to establish cognitive and entrepreneurial pioneering capabilities, which necessitate the participation of local governance actors, businesses, nongovernmental organizations (NGOs), and citizens.

In addition, the long-term transformational role of the state in polycentric systems needs to be compatible with core local economic goals. There is a “tension between learning from each other’s best practice[s] in terms of local climate experiments and innovation, and fierce economic competition for inward investment for ‘green’ jobs” (Wurzel et al. 2019, 162). Furumo and Lambin

(2021) suggest that also the private sector could fill the role of the state through self-regulation, but they give rise to a particular concern that the success of these efforts relies on a minimum level of institutional capacity from central governments. Dupuis and Schweizer (2019) go one step further by highlighting the importance of not only *where* and *by whom* but *how* and *when* institutional arrangements, such as ambitious goals, flexible means, and sanctions, are implemented. Finally, Sovacool and Martiskainen (2020) conclude that national policy may drive rapid transitions, but it is polycentric governance that has the potential to make it deep and transformative. Nevertheless, success depends not only on the establishment of an enabling policy environment but also on its ongoing maintenance (Furumo and Lambin 2021).

A further set of studies suggests that public bodies at the supranational scale can have substantial influence that can be seen throughout all levels of a polycentric climate governance system. For example, the EU is a key actor that, through its directives, can aid as well as pressure nation-states to enact policies that facilitate the emergence, the operation, and ultimately the scaling of local-scale initiatives. However, limited capacities and resources and fragmented governance pose key barriers at the local level to reaping the full potential of the governance arrangements (Ringel 2018). Local actors can be partially unaware of existing EU funding or capacity-building possibilities, while they need access to best practices, exchange networks, and financial support. Another example is the ASEAN-CRN, which facilitates climate action globally and in national and regional policy processes. The ASEAN-CRN functions through self-organization based on the identification of shared priorities, recognizes context-specific conditions through deliberation, and enables mutual learning through the facilitation of experimentation, knowledge exchange, and building of trust (Fasting et al. 2021). The Paris Climate Agreement also represents the potential of supranational entities to encourage subnational governments to function as direct and independent actors within the global climate regime. For example, motivated by taking ambitious climate action, the province of Québec (Canada) and the state of California (United States) joined the Paris Climate Agreement independently of their central governments (Chaloux et al. 2022).

Toward a Research Agenda on the Role of the State in Polycentric Climate Governance

In a time when climate governance is becoming increasingly polycentric, we are convinced that more analytical depth is necessary to understand the role of the state in polycentric governance. Many studies in the literature review show that the state has an important role to play in both regulating markets and facilitating the uptake of alternative practices. As noted, there is a research gap in understanding how states can behave as entrepreneurial actors themselves. States can also generate markets that can work to address climate change (Setzer and Nachmany 2018; van den Brande et al. 2012). Understanding these dynamics

is becoming increasingly important as, for example, countries like the United States work to address climate change through market-based strategies like its hallmark federal climate bill the Inflation Reduction Act, whose effectiveness will hinge largely on the development of local and regional markets for renewable energy infrastructure and other advanced manufacturing.

It is not clear whether incentives-focused state strategies will be translated to lower governance levels or taken up by the private sector. Additionally, while states and subnational actors can work to block policy change, they may also work to shift responsibility to other entities, including both the private sector and subnational governments. Again, the United States offers a useful example where inaction at the federal level has spurred policy innovation in the private sector and at subnational levels (e.g., California state laws governing automobile emission standards and electric vehicle development). This issue is also related to the work of Tuhkanen and Vulturius (2022), who noted that the absence of the state can lead to real shortcomings in climate governance in non-governmental spaces. Finally, more research is needed to understand the role of supranational entities on national, subnational, or local climate activities. We consider the following questions as a research agenda on the role of the state in polycentric climate governance:

- How can national and subnational governments and the private sector collaborate to meaningfully address climate change?
- How, if at all, are state responsibilities over climate governance substitutable by the private sector and subnational governments? How do supranational entities have a legitimate effect on lower-level activities?
- How do political currents influence the effect of supranational policymaking on lower-level governments and the private sector?

Empirical Insights on Diffusing Local Action

The literature review demonstrates three main important factors for how local initiatives diffuse and replicate their actions and grow their initiatives. The factors are (1) knowledge sharing, (2) who transfers the knowledge, and (3) participating in transnational networks.

First, it becomes clear from the reviewed literature that community-based initiatives thrive when they transfer knowledge and know-how and learn from each other (Petrovics et al. 2022). This in effect feeds into the diffusion of community-based enterprises and/or cooperative initiatives. Knowledge sharing could happen both in a peer-to-peer manner between initiatives and vertically, moving from the local scale to higher scales (e.g., umbrella or meta-organizations). However, for the expansion of local initiatives, it is important not only to share knowledge but also to (re)generate place-based knowledge (Heckelman et al. 2022). Depending on the initiatives, it is also important to share different systems of knowledge, such as Indigenous knowledge and

Western scientific knowledge (de Wit and Mourato 2022). Co-creation processes could be necessary to build new knowledge (Vedeld 2022).

Second, beyond the availability of information and channels for the dissemination of learning, scholarly attention is also increasingly examining who transfers knowledge. One study shows that policy entrepreneurs could play an important role in transferring knowledge (Mintrom and Luetjens 2017). They are “energetic actors who work with others in and around policymaking venues to promote significant policy change” (Mintrom and Luetjens 2017, 1362; Mintrom and Norman 2009). For example, in the C40 Cities Climate Leadership Group (C40) and the Carbon Disclosure Project, policy entrepreneurs in and around policymaking venues promote policy change and scaling up through networking efforts and coalition building, intending to broaden their respective networks (Mintrom and Luetjens 2017). They also support scaling up through problem framing, which is an issue of power in polycentric systems.

“Willful actors” at the local level could also be important actors in transferring knowledge (Russell and Christie 2021). This takes place voluntarily across all levels of governance in the absence of national government coordination or subregional frameworks. However, these actors work mainly in isolation and without guidance, and for this reason, there is a need for more coordination where information- and knowledge-sharing networks can facilitate institutional change for climate action (Russell and Christie 2021).

Third, transnational networks driving the diffusion of local action can be public, private, or hybrid, depending on the actors and authorities involved. These networks aim to steer governance through information sharing, capacity building and implementation, and rule setting (Andonova et al. 2009). For example, transnational networks like C40 and the EU Covenant of Mayors (CoM) promote—inter alia—knowledge sharing. In the United Kingdom, city-level actors highlight the importance of this opportunity besides the work with central policymakers (Gillard et al. 2017). However, individual rules-in-use can make certain knowledge relevant to one initiative and incompatible with another. However, knowledge sharing hinges also on factors like leadership, trust, mutual adjustment, learning, and self-regulation (Heinen et al. 2022).

Transnational networks are not purely horizontal. C40, for example, partners with intermediary entities like philanthropic foundations and international NGOs, emphasizing public–private collaborations and technical, market-based climate solutions (Leal and Paterson 2024). This limits C40 member cities’ ability to devise their climate action strategies. Meanwhile, the CoM program empowers local authorities in the EU’s sustainable energy strategy by promoting coordination and learning (Domorenok 2019). Local authorities, regardless of context, view the CoM as a valuable tool for understanding the significance of coordinated climate action through joint political commitment, shared goals, and mutual monitoring. However, the performance of local authorities in different aspects of the network’s activities varies due to contextual factors. In a

similar vein, Sovacool and van de Graaf (2018) present how two transnational energy networks and two transnational climate governance networks have shortcomings in areas like clarity of purpose, funding, institutional formality, effectiveness, and resilience. Here powerful public or private actors can enhance these networks by adhering to key meta-governance principles, including defining a clear purpose, ensuring adequate funding and formality, and fostering resilience (Sovacool and van de Graaf 2018).

Toward a Research Agenda on Diffusing Local Action

Elinor Ostrom emphasized the need for diverse localized initiatives to tackle the challenges posed by climate change. She contested the idea of one-size-fits-all solutions and the belief that external authority and outside knowledge can universally resolve problems for distinct and context-specific communities (Ostrom 2009). Ostrom, alongside other scholars, highlighted the necessity to depart from generic, top-down, or centralized interventions. Instead, a focus on acknowledging social-ecological diversity and adopting interventions that empower communities to enhance their capacities for social learning, collective action, and local resource development is important (Ostrom and Cox 2010). Today, many local initiatives have been emerging, but more quantitative analyses, covering a larger number of cases in different domestic contexts, are necessary to understand how local initiatives interact, reinforce each other, diffuse, and upscale. Additionally, closely linked to the first issue area, it is not entirely clear what role public authorities and the state have to play in this process.

We also propose that future studies need to apply qualitative approaches to understand how local initiatives address climate change mitigation and contribute to resolving higher-order dilemmas by working at the local scale. More knowledge is also needed to understand the mechanisms of self-organization of local initiatives aimed at organized knowledge sharing and learning and communication channels. It is still unclear how community-based initiatives expand, deepen, and find the right scale and which actors are instrumental in assisting new initiatives in their stages of emergence as well as in diffusion and upscaling. The literature review provides some insights about transnational networks, but more research is necessary to understand how local preferences and decision-making could be supported by transnational networks. Accordingly, we identify the following key questions on the diffusion of local innovation:

- How do local initiatives interact, reinforce each other, diffuse, and upscale?
- What role do public authorities and the state take in institutionalizing local action?
- How do transnational networks secure compliance with the preferences and context factors of the members whom they aim to govern?

Empirical Insights on Local Democratic Preferences and Evidence-Based Policymaking

In the preceding section, we focused on how local initiatives can diffuse, learn from each other, share knowledge, and determine what works best and on who facilitates sharing knowledge and learning processes. However, different communities often have different local preferences, which need to be taken into account. Three studies show how regional polycentric governance processes integrating citizens, communities, NGOs, scientists, and local authorities bring different perspectives, competing interests, and local preferences together. This led to initiatives and regulations specific to the local context (Heckelman et al. 2022; Kellner et al. 2019; Vedeld 2022). Biehl et al. (2021) show how a polycentric spatial planning system could harmonize interests between the federal and local levels regarding wind energy. The polycentric approach counters the trend of centralization and homogenization and is able to compensate for national and regional regime incoherence, while also considering local democratic preferences.

However, polycentric governance processes need a lot of capacity, and some issues may not be possible to solve (Vedeld 2022). For example, a generally high acceptance level for the overall energy transition at the national level has been identified as a significant challenge at regional and local levels (Biehl et al. 2021).

Toward a Research Agenda for Local Democratic Preferences and Evidence-Based Policymaking

Evidence-based policymaking requires expertise, and a huge literature exists on how science and policy interact. From this literature (e.g., Pielke 2007; Turnhout 2022), it is well known that the science–policy interface should ideally be structured in a transdisciplinary way—meaning that citizens and communities are involved in identifying the priority issues, developing research questions, implementing methods, and analyzing results. However, this is certainly not a standard practice in climate science. While some scientists prefer to ignore practical questions and debates, others see their role only as an arbitrator of fact, and some “sell” their own preferred solutions as the way forward without much reflexivity of their roles as researchers (Pielke 2007). Closely related, there is also a need for tackling conflicts and dealing with the potential “dark sides of co-creation” (Vedeld 2022). Local democratic preferences are also linked to existing regulations and resource availability, and therefore future research should also analyze how institutional resource regimes and resources shape evidence-based policymaking.

Besides the transdisciplinary approach, it is important to understand how communities integrate local preferences. The literature provides some examples of how different actors share different perspectives, competing interests, and

local preferences. This raises questions not only on sharing knowledge and “what works best,” as discussed in the preceding section, but also on “what works best for whom, and why.” More comparative case studies could help to answer these questions. There is a critical need for future research to understand the governance processes that lead to local initiatives as an expression of democratic decision-making. Relatedly, we identified the following research questions:

- What works best for which initiative and why, and how could local preferences be integrated into local governance processes?
- How are local initiatives able to acknowledge evidence-based policy-making, and how is this shaped by institutional resource regimes and resources?
- What public leadership types and mentalities are needed to support transdisciplinary or co-creation processes?

Empirical Insights on the Role of Power in Polycentric Climate Governance

All three types of power (design, pragmatic, and framing power) were identified in the literature review. These studies show a significant role of power in polycentric climate governance systems, which leads to governance failures, such as inappropriate allocation of public funds due to ignoring local circumstances and knowledge and economic interests.

Three studies describe the impact of design power on polycentric climate governance systems. Two of them show how unequal power distribution could lead to governance failures, such as integrated policy approaches and inappropriate allocation of public funds due to institutional ties, ignorance of context conditions and local circumstances, and suppression of learning processes across divergent groups of actors (Ha and Kumar 2021; Milhorange et al. 2020). Kaiser (2022) suggests that the transnational climate change governance landscape is institutionally polycentric but spatially centralized. Despite the increase in initiatives aiming to govern climate change transnationally, the geospatial distribution of these initiatives seems to be resistant to change, with headquarters being located mainly in North America and Europe. This is a form of design power where power dynamics shape “who writes the overarching system of rules that pervade polycentric systems” (Kaiser 2022, 16).

A case that has been studied extensively to understand the workings of pragmatic power is the Great Barrier Reef in Australia. The governance regime to manage the reef was designed by actors who used their pragmatic power to avoid the implementation of relevant legislation and industry; politicians and segments of the media framed the rules as an impediment to economic development (Morrison 2017). A further example of subnational climate governance and Indigenous peoples’ participation is the Brazilian and Peruvian Amazon (de

Wit and Mourato 2022). Here, pragmatic power leads to the dominance of “established climate change knowledge politics and ways of knowing that prioritize economic growth whilst destroying ancestral wisdom,” despite participatory processes (de Wit and Mourato 2022, 11). The same study by de Wit and Mourato also identifies framing power, which addresses questions on who frames problems, sets the norms, and influences discourse across decision-making centers.

Toward a Research Agenda for the Role of Power in Polycentric Climate Governance

Polycentric governance systems ideally enable several advantages, such as enhanced adaptive capacity, good institutional fit, and risk mitigation (Carlisle and Gruby 2019). However, powerful actors and units are able to influence goals, processes, and outcomes of polycentric systems for their benefit, which is still not a well-researched topic. More longitudinal studies assessing the power dynamics over time and in more detail are necessary. Most studies take a short-term view, providing only a brief snapshot of power dynamics. This is not an easy task, but it is critical to understand and manage power dynamics in polycentric systems to benefit from the advantages of polycentric systems. Focus is also needed on less visible power dynamics taking place and functioning across multiple scales and venues. Furthermore, what distinguishes constructive power dynamics from destructive attempts?

The three types of power developed by Morrison et al. (2019) are a useful starting point; however, other types of power could also be assessed. This typology can be understood as “power over,” which is the “capacity of actors to exert control or influence over others overtly or implicitly” (Partelow and Manlosa 2023, 269). Future research should also address productive types of power in polycentric governance systems, such as “collaborative power with”: this could focus on coalitions or alliances where individuals come together as a group to strengthen their voice and effect change in pursuit of climate goals (Partelow and Manlosa 2023). We need greater descriptive and analytical insights on when, how, and under what conditions different types of power emerge and persist. Moreover, the question remains how this enables different types of actors, with different types of power, to shape polycentric systems and to achieve their preferred outcomes. For this issue, we identify the following key questions:

- When, how, and under what conditions do different types of power emerge and persist in a polycentric governance system?
- How do power dynamics change over time in a polycentric governance system?
- How do collaborative forms of power manifest in polycentric governance thinking?

Conclusions

The global climate governance system is becoming more polycentric with the consequence of more constituting actors and units interacting. In examining existing science and related empirics, this article identified four important issues: the role of the state, diffusion of local action, integration of local democratic preferences, and the role of power. The results of a literature review on empirical polycentric climate mitigation studies provide insights into the underlying mechanisms and processes and point to fundamental research gaps based on which we outline research agendas for the future.

In general, the number of publications about polycentric climate governance has grown since 2015. However, there is still a meager total, considering the urgency to mitigate climate change (IPCC 2023). Most of the studies examine the national scale and are focused on Europe. There is an obvious lack of studies on a variety of other continents. The authors of the empirical studies use mainly comparative or multisite and single case study designs. Main data sources were a mix of qualitative approaches, such as interviews, document analysis, and participatory observation.

Conceptually, the current literature on polycentric climate governance shows that polycentric governance thinking overall is still underdeveloped. This complicates the comparison of empirical studies and impedes the cumulation of knowledge that is key to strengthening climate action at all levels.

Some polycentric governance scholars tend to undervalue or entirely overlook the role of the state. The empirical articles reviewed in this study show the importance of states at the national level in establishing regulatory frameworks, steering programs and policies, and providing financial assistance and interjurisdictional coordination. The relationship of the state with other types of actors, why the state facilitates climate initiatives in some cases and does not in others, and how the state extends its role beyond providing the rule of law remain unclear.

The literature review demonstrates that knowledge sharing, who transfers the knowledge, and participating in transnational networks are key factors for how local initiatives diffuse and replicate their actions and grow their initiatives. However, knowledge exchange incurs transaction costs. There is less comprehensive knowledge on how local initiatives interact, reinforce each other, diffuse, and upscale. Linked to the first issue, it is not entirely clear what role public authorities and the state play in this process. More studies are necessary to understand how transnational networks consider local preferences and context factors.

On the other hand, the literature gives some insights into how initiatives secure compliance with local democratic preferences. However, more comparative case studies are necessary to understand what works best for whom, why, and how this could be integrated into local governance processes.

These themes are also linked to the role of power in polycentric climate governance and the different characteristics that distinguish constructive and

supportive power dynamics from destructive attempts. The literature gives some insights, but most studies take a short-term view, and more longitudinal studies assessing the power dynamics over time and in more detail could provide valuable contributions. This would enable the management of power dynamics and therefore benefit from the advantages of polycentric systems.

The impacts of climate change affect people more severely and with greater immediacy than envisioned a decade ago (Diffenbaugh 2020). This is particularly true for extreme events, such as heat waves, droughts, wildfires, extreme precipitation, floods, storms, and variations in their frequency, magnitude, and duration (Tollefson 2023). Given the urgent need for climate action and the shift of climate governance to a polycentric system, there is surprisingly little cumulative knowledge about specific mechanisms and processes of polycentric climate governance. This article presents important empirical insights from the literature and provides a detailed research agenda for future research. The research agenda will, we hope, help scholars in climate governance to focus on research topics of high importance. This is key to strengthening climate action on different levels and reaching the goals of the Paris Climate Agreement.

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