Unpacking Polycentric Climate Governance: Tracing the Evolution of Transnational Municipal Networks over Time

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Abstract

All governance systems are polycentric to some extent in that they comprise multiple actors with varying degrees of autonomy. However, there has been limited theorization as to how we might measure polycentricity, even though this could help us unpack networks and understand governance arrangements better. We present three dimensions of governance to conceptualize degrees of polycentricity—governance *of* networks (internal organization and management at the network level), governance *by* networks (their impacts at the membership level), and governance *with* networks (collaboration with other actors at the system level). We then trace the evolution of three transnational municipal networks (the Climate Alliance, Covenant of Mayors, and 100 Resilient Cities/Resilient Cities Network), which are located at different positions along the polycentric–monocentric spectrum. We examine how these networks have become more or less polycentric over time and highlight trade-offs between different dimensions of polycentric governance, most notably governance *of* and governance *by*.

Keywords: transnational municipal networks, climate governance, polycentric governance, Climate Alliance, Covenant of Mayors, 100 Resilient Cities, Resilient Cities Network

By definition, "polycentric" systems feature multiple centers of authority, flexibility, and a lack of hierarchy—attributes that increasingly characterize climate governance arrangements across the globe. In the international climate regime, for example, the lack of a powerful, "monocentric" actor means that few procedures are in place to monitor and sanction noncompliance (Jordan et al. 2018). Indeed, the academic literature has emphasized the importance of polycentric governance for many years (see, e.g., Bulkeley et al. 2003). First-generation transnational municipal networks (TMNs) were characterized as "non-

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hierarchical, horizontal and polycentric" formal organizations (Kern and Bulkeley 2009, 310).[1] However, a new generation of TMNs has emerged that exhibit more monocentric features (Nielsen and Papin 2021).

Power and authority are always dispersed to some extent, and therefore all governing systems have polycentric elements (Jordan and Huitema 2023; Tobin et al. 2024). However, few studies have sought to unpack the "black box" of governance to gain a better understanding of the extent to which a system may be polycentric (Dorsch and Flachsland 2017; Galaz et al. 2012; Kim 2020). Thus we introduce three novel dimensions of governance to help unpack and operationalize the concept, locate TMNs along each of them, and track developments over time. These dimensions are governance *of* networks (their internal organization and management arrangements at the network level), governance *by* networks (their impact at the membership level), and governance *with* networks (their collaborations with other networks and organizations at the system level). With this heuristic, we offer a way to conceptualize, understand, and compare how governance may operate in different contexts. By analyzing how TMNs change their positions along the spectrum between polycentricity and monocentricity over time, we highlight potential dynamics and trade-offs between the three governance dimensions. As such, first, we build theory by providing a better understanding of the interactions between the three dimensions of governance and, in particular, the trade-offs between them, and second, we develop methods for assessing the three dimensions of governance across cases and over time.

Assuming that TMNs seek to achieve both compliance with network goals and scaling across municipalities, we trace the evolution of three selected TMNs (the Climate Alliance [CA], Covenant of Mayors [CoM], and 100 Resilient Cities [100RC]/Resilient Cities Network [RCN]) along these three dimensions. Most previous studies into TMNs have tended to focus on single rather than comparative case studies (e.g., Gordon 2020; Nielsen and Papin 2021) and have not considered their development over time. Alongside offering a new theoretical contribution to help conceptualize polycentric governance, our article therefore also fills a gap in the empirical literature.

We found that all three networks are converging in terms of governance *of* and *with*, but there is far less convergence with respect to compliance with network goals (governance *by* networks), which is higher in monocentric networks. There is also a persistent trade-off between the effectiveness of monocentric networks and the self-organizing potential of polycentric networks. By this we mean that more polycentric networks require a certain degree of central coordination to balance the high autonomy of members, while more monocentric networks need more self-organization.

1. We use the term *transnational municipal networks* because all three networks that we analyze in this article include municipalities that do not classify as cities.

In the next section, we introduce the literature on polycentric governance, with a specific focus on how it applies to TMNs. We then focus on the evolution of TMNs, introduce our case selection and methods, and examine the three networks before setting out how their approaches to governance *of*, governance *by*, and governance *with* networks have evolved since their conception. We then discuss our findings in the context of the literature, summarize our contribution, and identify remaining research gaps.

Polycentric Governance and TMNs

Polycentric Governance

Rather than being characterized by a single actor exercising hierarchical coercion, polycentric systems like first-generation TMNs operate across different levels and include multiple overlapping centers of authority (Skelcher 2005), which are autonomous and collaborate on a voluntary basis. In line with the other articles in this special issue, we build from Elinor Ostrom's (2010b, 552) definition:

> 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.

These multiple centers of authority often emerge "from below," in response to complex issues that traditional bureaucracies are ill designed to address effectively (Peters and Pierre 2021). They may also include private and voluntary organizations that contribute in some way toward governing a policy issue. Since autonomous centers of authority operate independently of each other, there is no expectation that government bodies are steering and coordinating how these organizations act. As such, there are clear overlaps with concepts like multilevel or network governance (Hooghe and Marks 2001; Rhodes 1997), although polycentric arrangements are perhaps (even) more likely to be characterized by loose, informal, and interorganizational networks and the involvement of nonstate actors than these other two perspectives (Heinen et al. 2022).

Scholars have argued that the lack of a coordinating actor within a highly polycentric system may increase the likelihood that governance approaches will be uncoordinated and incoherent, that activities will conflict or overlap, and that "free-riding" will become more common (Galaz et al. 2012). The polycentric governance literature tends to be more positive about the lack of central steering, perhaps because it examines mainly bottom-up arrangements, which allow actors to develop their own context-specific strategies to tackle problems and learn from others' experience (Ostrom 2010a, 2010b). Therefore, where a central coordinator to direct or coerce local actors is lacking, some

uncoordinated and possibly incoherent activity may well be preferable to the alternative of no action—particularly if it may have broader impacts that are difficult to capture and measure (van der Ven et al. 2017).

Polycentric governance offers a more comprehensive (and perhaps more realistic) framework than monocentric perspectives, particularly where scholars examine phenomena that a range of different actors are seeking to address and a single coordinating actor does not exist. Societal actors may wish to respond to a challenge like climate change in a bottom-up, polycentric manner by developing their own approaches (Ostrom 2010a, 2010b). Indeed, particularly since the 2015 Paris Agreement, scholars are increasingly viewing global climate governance through a polycentric lens (Jordan and Huitema 2023; Jordan et al. 2018). A key element of this agreement involved governments "self-organizing" and putting forward voluntary emission reduction targets that cannot be enforced through hierarchical legal mechanisms, and it also stressed the key role of nonstate actors. By focusing on three dimensions of TMN governance and the trade-offs between them, we depart from polycentric approaches to global climate governance that include TMNs alongside other types of state and nonstate actors (Dorsch and Flachsland 2017).

TMNs as Polycentric Climate Governance

First-generation TMNs feature many key characteristics of polycentric governance, including a lack of hierarchical coercion, local self-organization, multiple centers of authority, and rule-making on different scales, and they have long been recognized as important actors in local climate governance. Studies in this field have acknowledged the reality of multiple decision-making centers for over two decades (see, e.g., Bulkeley et al. 2003). Given that various TMNs have developed in the area of local climate and energy policy over recent decades (Gordon 2020; Haupt and Coppola 2019; Kern and Bulkeley 2009; Nielsen and Papin 2021), we can see how they represent a useful case for examining many of the questions that scholars of polycentric governance seek to address, such as why some actors within polycentric systems are more ambitious or innovative than others or how they seek to overcome structural challenges to progress (Cortes et al. 2022; Kern 2019; van der Heijden 2018). However, although we start from the assumption that TMNs are polycentric systems, they may also exhibit monocentric features. Therefore we develop analytic tools to assess differences between TMNs and the implications for governing them.

TMNs have to be understood as formal organizations because they have dedicated staff and headquarters (Busch 2016). There is a large literature on TMNs that seek to tackle sustainable development and climate change, including single and comparative case studies (Heikkinen et al. 2020; Papin 2020), for example, on the International Council for Local Environmental Initiatives (ICLEI) (Yi et al. 2017), as well as on newer networks like C40 (Davidson et al. 2019; Gordon 2020) and 100 Resilient Cities (Coppola and Haupt 2023;

Nielsen and Papin 2021). More recently, scholars have studied the experiences of specific member cities in depth (see, e.g., Coppola et al. 2020; Kochskämper et al. 2024; Moloney and Doyon 2021).

However, less prominent TMNs, such as the CA, have received far less attention. Also, few studies have examined how the governance of different TMNs has evolved over time, how TMNs are governed, how TMN membership affects the implementation of local climate policy, or how networks interact with each other (Cortes et al. 2022; Haupt et al. 2020; Kern and Bulkeley 2009; Rashidi and Patt 2018). The dynamic nature of transnational climate governance in general and TMNs in particular suggests that TMNs may have evolved along the three dimensions of governance *of* networks, governance *by* networks, and governance *with* networks.

Dimensions of TMN Governance

The academic literature conceptualizes governance in multiple ways but shares a desire to understand organizational decision-making and how actors, societies, and systems are governed (Peters and Pierre 2021). Here we develop and present three dimensions of governance to contribute toward this endeavor. We start from the assumption that the governance of TMNs involves three levels of analysis, which correspond to a tridimensional approach to polycentric governance: the network level, the membership level, and the system level. We base our three dimensions on previous studies that suggest it refers to decision-making processes within organizations (Spitzeck and Hansen 2010) at the network level, capacities for steering and enforcement (Pierre and Peters 2020) at the membership level, and collaboration and coproduction with other actors (Sørensen and Torfing 2017) at the system level.

First, we examine governance *of* networks, by which we mean how they are structured and governed internally (Acuto and Ghojeh 2019). In more monocentric TMNs, a central authority dominates decision-making, and members may be less involved. Our focus here is on the multiplicity of internal decision-making bodies (general assembly, executive board, president, secretariat, etc.), members' involvement in organizational committees, boards, strategy development, and the network's management structure (secretariat, staff). Since polycentric systems have multiple centers of authority and more horizontal power structures, TMNs that are characterized by a multiplicity of internal decision-making bodies, more options for member cities to participate in decision-making, and limited power of the secretariat (and its head) would be located toward the polycentric end of the spectrum.

Second, we operationalize steering and enforcement capacities in terms of governance *by* networks, which relates to their impact at the membership level. We anticipate that where a TMN has fewer steering and coercive capacities, individual members can exercise greater individual autonomy, and the network will therefore be more polycentric. As such, in more polycentric TMNs, members are

less likely to monitor, are less likely to report their compliance with the strategic goals of the network (such as climate neutrality) (see also Rayner and Jordan 2013, 80), and do not face sanctions if they fail to comply with network rules. In contrast, more monocentric TMNs would seek to exert increasing pressure on their members to undertake climate action.

Our third dimension covers relationships with external actors at the system level (Acuto and Ghojeh 2019): we conceptualize this as governance *with* networks, and it refers specifically to the openness of the network to external collaboration. We focus on individual networks here, although their initiatives at the system level may have repercussions for the "global ecosystem of city networks" (Acuto and Leffel 2021). We expect more polycentric TMNs to be more open to collaborating with other TMNs, in particular TMNs with similar characteristics; nonstate actors, such as NGOs, which represent another type of network organization; and governmental actors, such as national ministries or the European Commission, on a frequent basis. Collaboration may even lead to mergers between networks and an increasing degree of embeddedness of TMNs in governmental organizations.

Empirical Context: Evolution of TMNs

Shortly before, and particularly after, the Rio Conference in 1992, the first TMNs, such as the ICLEI, originated around the topic of sustainable development and climate policy. We have identified three trends in their evolution since the early 1990s:

1. While first-generation networks (such as the European Sustainable Cities and Towns Campaign) were founded bottom-up by cities and their mayors in the early 1990s, a new generation of TMNs was initiated top-down by governmental and private actors (including philanthropic organizations). These later networks included the Compact of Mayors, launched by United Nations secretary-general Ban Ki-moon and his special envoy for cities and climate change Michael Bloomberg.
2. TMNs became increasingly exclusive, after previously welcoming any municipality willing to join. An early example for exclusivity, related to size, is Eurocities, which accepts only major European cities as members.
3. While TMNs initially depended mainly on membership fees for funding, they have become gradually more reliant on external sources, for example, European Union (EU)-funded projects. This includes funding by philanthropic organizations that have become important for the funding of networks like C40.

Today, a variety of TMNs exist. They can be characterized by type of formation (bottom-up vs. top-down), admission rules (inclusive vs. exclusive), and funding (internal vs. external) (see Table 1).

Table 1
Characteristics of the Climate Alliance, the Covenant of Mayors, and 100 Resilient Cities/Resilient Cities Network

	Climate Alliance	*Covenant of Mayors*	*100 Resilient Cities/Resilient Cities Network*
Formation	Bottom-up by municipalities and NGOs	Mixture of top-down (by the European Commission) and bottom-up (by cities and their networks)	Top-down by the Rockefeller Foundation
Admission	Inclusive	Inclusive	Exclusive, selective
Funding	Internal funding through membership fees; external project funding (national, EU)	EU funding for the CoM Office (run by various TMNs)	100RC: external funding from the Rockefeller Foundation RCN: diverse sources (such as Development Bank of Latin America)
Goals	Original goal (1990): reduce GHG emissions by 50% by 2010	At least 20% GHG emissions reduction by 2020; at least 40% by 2030; climate neutrality by 2050	Resilience strategies
	Revised goal (2006): reduce GHG emissions by 10% every 5 years; 50% reduction by 2030	Sustainable energy (and climate) action plans, risk and vulnerability assessments	Identification of potential shocks and stresses Actions for adapting to shocks and stresses

100RC = 100 Resilient Cities. EU = European Union. CoM = Covenant of Mayors. GHG = greenhouse gas. NGO = nongovernmental organization. RCN = Resilient Cities Network. TMN = transnational municipal network.

Case Selection and Methods

Empirically, previous research on TMNs has focused on individual networks, such as the ICLEI (Yi et al. 2017) and C40 (Gordon 2020). Their increasing diversity led scholars to develop a range of different typologies to categorize

and analyze TMN activities (Haupt and Coppola 2019). These typologies provide a useful heuristic for mapping and comparing different TMNs, but they are not yet linked to debates on polycentric governance.

For our study, we selected the CA, CoM, and 100RC/RCN as comparative case studies based on two criteria. First, each TMN requests that members make specific commitments, which then provide identifiable and measurable outputs (e.g., CO_2 emission reductions) (see Table 1). All three networks have developed such commitments for all members. Second, and in line with Seawright and Gerring's (2008) characterization of diverse cases, we analyze TMNs that differ in terms of their genesis and general characteristics. The CA started as an inclusive, bottom-up network initiated by pioneering cities in 1990, self-funded by membership fees. In contrast, 100RC was set up as an exclusive, top-down network in 2013, funded by the Rockefeller Foundation. Like the CA, the CoM is an inclusive network, but its establishment in 2008 was a mixture of top-down and bottom-up processes, characterized by the close collaboration between city networks and the European Commission, which has provided funding for the operation of the CoM Office (see Table 1).

Thus the three selected cases represent different types of TMNs that were located at different positions along the polycentric–monocentric spectrum at their inception. This research design enables us to trace and compare the evolution of each TMN over time along our three dimensions of governance. For doing this, we apply the criteria mentioned above in the section "Dimensions of TMN Governance" and depicted in Table 2.

Table 2
Governance Dimensions and Assessment Criteria for Polycentric Governance

Governance Dimension	*Assessment Criteria*
Governance *of* (network level)	1. Multiplicity of internal decision-making bodies
	2. Options for members' involvement in organizational committees, boards, and strategy development
	3. Limited power of managing bodies (secretariat) at network level
Governance *by* (membership level)	1. Monitoring at local level
	2. Reporting on the network's goals to the network on a regular basis
	3. Options to sanction noncompliance
Governance *with* (system level)	1. Collaboration with other TMNs
	2. Collaboration with nonstate actors
	3. Collaboration with governmental actors

TMN = transnational municipal network.

We assess the three dimensions of governance based on these criteria and classify them as low (1 and lower), medium (between 1 and 2), or high (between 2 and 3). For governance *of* and *with*, high scores suggest a high degree of polycentricity, since the dimensions indicate a bottom-up, self-organized structure at the network level and the openness of TMNs to participating in an overall polycentric system. For governance *by*, we assume that more polycentric TMNs have lower scores because they have fewer features to force members to monitor their progress, report on objectives, and comply with network rules.

We employed document analysis, participant observation, interviews with key actors in each network, and previous studies, including our own published and unpublished research on TMNs. In terms of documents, we analyzed, for example, the CA's annual review and outlook reports and the resolutions adopted by its General Assembly (Climate Alliance 2020, 2021, 2024a, 2024b). For the CoM, we consulted academic articles as well as the reports and assessments of the EU's Joint Research Centre (JRC) (Joint Research Centre 2015, 2017, 2020, 2022, 2023). We also attended thirteen events, including the CA's international annual conferences and various CoM events, the launch of Rotterdam's Resilience Strategy (co-organized by 100RC), events organized by other TMNs (namely, the ICLEI and Energy Cities), and events that were co-organized or attended by TMN representatives (such as the annual European Week of Regions and Cities). Moreover, we drew on sixty expert interviews: twenty-three with TMN representatives, including employees at both management and operational levels, and a further thirty-seven with city practitioners responsible for coordinating TMN-related activities. Given the EU focus of two of the three studied TMNs, the majority of interviews were conducted in Europe. Nevertheless, our sample also includes twelve interviews from non-European countries, such as the United States, Australia, South Africa, and India (all related to 100RC/RCN). We undertook most of this fieldwork between 2017 and 2023, although some of the initial interviews at network and membership levels for the CA were conducted in the early 2000s. For the more recent interviews, we prepared a semistructured interview guide following the three governance dimensions; we applied these dimensions retrospectively to the earlier interviews through a secondary analysis. We then employed qualitative content analysis and applied the three dimensions of TMN governance to draw out key findings from our data. This mix of empirical data provides a sound basis for their triangulation, in particular, for examining the evolution of the three networks over time.

Evolution of the CA, the CoM, and 100 RC/RCN

Climate Alliance

The CA, founded in 1990 and developed bottom-up in close cooperation with several NGOs, is one of the largest first-generation TMNs. It helps member cities

improve local capacities for climate policy; supports the exchange and transfer of knowledge among its members; and represents them at national, European, and international levels (Kern and Bulkeley 2009). The network's founding was triggered by the "Amazonia days," a conference that took place in Berlin in 1989, focusing on the destruction of the tropical rain forests in South America and its effects on Indigenous peoples (Climate Alliance 2020; Mayer-Ries 1999). In a follow-up conference in Frankfurt am Main, the Climate Alliance of European Cities with Indigenous Rainforest Peoples was founded, and it officially registered as an association in Germany in 1992 (Climate Alliance 2020). Since the City of Frankfurt was a founding member and supported the network from the start, for example, by providing offices, the CA's headquarters is still located there.

Membership of this inclusive network increased rapidly during its first decade. In 2004, the CA already had more than 1,000 full members (i.e., municipalities), a figure that rose to almost 2,000 by January 2024, spread across twenty-six European countries. From the outset, membership has included not only large metropolitan areas but also smaller municipalities. However, since the network's main working language has been German, more than 93 percent of members are located in only three countries: Austria (1,092 members), Germany (627 members), and Italy (125 members) (Climate Alliance 2024b).[2]

Covenant of Mayors

In 2008, the European Commission (DG Energy), supported by the EU Parliament and the Committee of the Regions, set up the CoM to support implementation of the EU Climate and Energy Package of 2008. As such, the CoM was founded in a more top-down manner than the CA. However, the CoM Office in Brussels was never run directly by the European Commission but by a consortium of all major TMNs, including Energy Cities, the CA, and Eurocities. The CoM has evolved considerably since its inception. In March 2014, the European Commission (DG Climate Action), together with the European Environment Agency, introduced Mayors Adapt on climate adaptation, which merged with the CoM in late 2015 to become the Covenant of Mayors for Climate and Energy. In 2016, the CoM merged with the Compact of Mayors and became the Global Covenant of Mayors for Climate and Energy. By January 2024, approximately 11,900 cities and towns in forty-six countries had joined the initiative.

As with the CA, any municipality can sign up to the CoM, but some European countries are better represented than others. In January 2024, 46 percent of the signatories were located in Italy and 26 percent in Spain, including many medium-sized cities and small towns (Covenant of Mayors 2024). This is partly

2. Most Italian members are located in German-speaking (bilingual) Southern Tyrol.

due to some national governments launching similar initiatives: municipalities in countries, such as Germany, that can access national government support have fewer incentives to join the CoM than their counterparts in other countries (Kern 2019).

100 Resilient Cities/Resilient Cities Network

The RCN, formerly known as 100RC, was founded top-down in 2013 by the Rockefeller Foundation and represents a new generation of TMNs (Nielsen and Papin 2021; Papin 2020). Today, it consists of ninety-eight cities in forty-six countries in five (world) regions. Cities had to undergo a competitive application process in three consecutive rounds to be admitted to this exclusive and selective network. The goal of RCN/100RC is urban resilience in general; however, most cities identified climate change as the main challenge they face and focus therefore on climate adaptation and mitigation (Coppola et al. 2020).

In 2019, the Rockefeller Foundation stopped financing the 100RC but continued to provide funding for ongoing strategy development and implementation in various former member cities. In 2020, the network reemerged in the form of two different initiatives, the Resilient Cities Catalyst and RCN (Coppola et al. 2020). RCN, which considers itself the successor of 100RC, continues to be based on an exclusive membership model, in which cities apply to join and can access funding opportunities through the network. This model resulted in a rather heterogeneous membership structure. A large proportion of member cities (twenty-four) are located in the United States, and megacities, such as Mexico City, and forerunners, such as Paris, are as much a part of the network as smaller municipalities, such as Vejle (Denmark) or Santa Fe (Argentina) (Coppola and Haupt 2023; Nielsen and Papin 2021).

Three Dimensions of Network Governance

Governance of Networks

The CA has multiple internal decision-making bodies at the network level. The CA Secretariat in Frankfurt am Main is responsible for coordinating network activities, communicating with members, and implementing joint projects. It has only limited powers but carries out the decisions of the CA Executive Board, which consists of thirteen members, including a representative of the Coordinadora de las Organizaciones Indígenas de la Cuenca Amazónica (COICA, or, in English, the Coordinator of Indigenous Organizations of the Amazon River Basin), an umbrella organization for the Indigenous peoples of Amazonia. At the network's General Assembly, which takes place at its annual international conference, members discuss and decide on strategic topics and pass resolutions that the Executive Board implements. Moreover, relatively autonomous national coordination offices exist in Austria, Germany, Italy, Luxembourg, Switzerland,

and Hungary, which adds to the polycentricity of the network. CA Europe, the national coordination offices, and the Executive Board represent the interests of the CA externally (Climate Alliance 2024a; Kern et al. 2023).

Like the CA's Secretariat, the CoM Office in Brussels is responsible for everyday work, for example, organizing events and providing a help desk, and it also serves as an interface between the signatories and the European Commission. Its powers are limited, because in recent years, new organizational bodies were established. These include a Political Board, which consists of ten mayors and locally elected representatives from the signatories and decides on strategic questions; the Group of Ambassadors, which represents the Committee of the Regions and the EU Parliament; and the Group of Practitioners. Moreover, the CoM is supported by 204 "covenant coordinators" (national and regional authorities) and 287 "covenant supporters" (national and regional municipal networks and associations, local and regional energy agencies) (Covenant of Mayors 2024), which help signatories fulfill their requirements. Despite the increasing multiplicity of organizational bodies, which makes the network more polycentric, opportunities for ordinary members to participate directly in decision-making are still limited. In contrast to the CA, no clear provisions clarify the responsibilities and tasks of the various organizational bodies or regulate signatory participation.

In the initial 100RC, the network steered the implementation process through its well-resourced headquarters in New York and three regional offices in London, Mexico City, and Singapore. This top-down approach focused mainly on strategy development, without much consideration of local contexts or dynamics. Chief resilience officers (CROs) financed by 100RC were responsible for the implementation process in participating cities (Nielsen and Papin 2021). Following the reorganization from 100RC to RCN, the network shifted toward a more city-led approach to governing. The global steering committee, comprising ten CROs representing five geographic regions (Africa, the Asia–Pacific, Europe/the Middle East, Latin America/the Caribbean, and North America), decides on strategic direction, for example, allocation of financial resources and priorities (Coppola and Haupt 2023). These officers are elected by cities in their respective regions. A board of directors, comprising two chairs and five board members, including city executives, corporations, NGOs, and international organizations, decides on general strategies as the administrative body. The new structure, which started to move this highly monocentric network more toward polycentricity, was established from the beginning of RCN in response to demands by the CROs.

Governance *of* the three TMNs differed considerably at the network level, in particular with respect to the multiplicity of internal decision-making bodies and membership involvement. However, in recent years, the three networks have seemed to converge with respect to this governance dimension. The CA has had numerous decision-making bodies since its creation in 1990, and this multiplicity has also increased in the CoM and RCN (see Table 3). The CA developed bottom-up, and direct member participation in decision-making has

Table 3
Degrees of Polycentricity in the Governance *of, by*, and *with* Transnational Municipal Networks over Time

	Climate Alliance	*Covenant of Mayors*	*100 Resilient Cities/Resilient Cities Network*
Governance *of* (network level)	High–high; stable	Low–medium; increased	Low–medium; increased
Governance *by* (membership level)	Low–low; stable	Medium–medium; stable	High–medium; may decrease
Governance *with* (system level)	Medium–high; increased	High–high; stable	Low–medium; may increase

always been more pronounced than in both other networks, for example, by organizing annual conferences and meetings of the General Assembly. Thus the CA exhibits the most polycentric features regarding governance *of* the three networks. Interestingly, the initial structure of vertical oversight and exclusive decision-making in the 100RC shifted to a more polycentric structure in the RCN (see Table 3 and Figure 1).

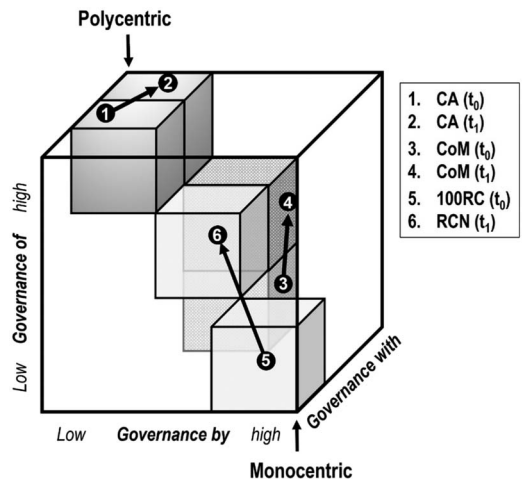

Figure 1
Governance of Transnational Municipal Networks Between Polycentricity and Monocentricity

100RC = 100 Resilient Cities. CA = Climate Alliance. CoM = Covenant of Mayors. RCN = Resilient Cities Network.

Governance by Networks

Owing to its rather decentralized organizational structure at the membership level, the CA is unable to exercise hierarchical authority to enforce the emission reduction targets set by the network (see Table 1). Instead, it collaborates with its members on joint projects and runs campaigns. However, members must formally endorse the CA's overall principles and goals (including CO_2 emission reduction targets; see Table 1), because admission to the network requires a city council decision. Thus the CA has provided incentives for members to monitor emissions and has developed web-based accounting and monitoring tools to help members measure them. In 2004, the General Assembly adopted its "Guidelines for the Preparation of CO_2 Emission Inventories by Climate Alliance Member Municipalities." The CA also set up a working group through which members exchange their experiences of monitoring. There is strong empirical evidence that an increasing number of CA members monitor their emissions, in particular, mid-sized and big cities. This applies, for example, to all CA members that joined the CoM. Moreover, the CA national coordination offices started monitoring initiatives, for example, in Germany, where more than 30 percent of CA members are located. In 2023, almost 2,200 German municipalities, among them many CA members (such as Aachen, Bonn, Leipzig, and Munich), used the Climate Protection Planner. This monitoring tool was developed by the CA and has been offered since 2016 as a service (for a fee), including training sessions and a hotline (Climate Alliance 2020, 2021, 2023).[3] However, although an increasing number of CA members monitor their emissions, they are not required to report them to the CA on a regular basis, and there are no sanctions for noncompliance.

CoM signatories initially committed themselves on a voluntary basis to reducing their emissions by at least 20 percent by 2020 and now aim to cut them by at least 40 percent by 2030 (see Table 1). Although signatories do not receive EU funding when joining the CoM (Basso and Tonin 2022),[4] they are required to monitor their emissions and submit emission inventories, sustainable energy (and climate) action plans (SEAPs/SECAPs), risk and vulnerability assessments, and monitoring emissions inventories. The European Commission's JRC is in charge of controlling and accepting these reports. In case of noncompliance, membership can be put on hold or suspended. Approximately 80 percent of the signatories are active (Basso and Tonin 2022). By May 2021, signatories from EU 27 had submitted 5,763 SEAPs/SECAPs with a target for 2020 through the MyCovenant reporting platform (Lucchitta et al. 2024). Cities that provided at least one monitoring report reduced their greenhouse gas

3. See https://www.klimaschutz-planer.de/, last accessed July 8, 2024.
4. Signatories may have better chances when they bid for EU-funded projects, but they are not obliged to apply for EU funds. They may apply for national funds instead or use their own funds.

(GHG) emissions on average by 26 percent between 2005 and 2020 (Joint Research Centre 2022; Rivas et al. 2022).

Resilience is more difficult to measure than GHG emissions. Therefore, instead of formal reporting requirements for members, 100RC/RCN proposed milestones, particularly the development of resilience strategies and the institutional integration of CROs. Despite some shortcomings, compliance was high in 100RC. According to interview partners, eighty-three cities developed resilience strategies, with approximately 70 percent currently implementing them in the RCN. One-third of cities are updating their strategies to consider not only specific but also compound risks as highlighted by the COVID-19 pandemic. Interview partners also confirmed that 85 percent of all participating RCN cities have CROs. Although these posts do not always survive a change in city government, the majority of officers are now salaried municipal staff (Coppola and Haupt 2023). The network has sought to gain support from important city stakeholders to help these posts survive mayoral transitions, and 100RC could execute indirect sanctions by terminating their funding. Today, CROs are an integral and institutionalized part of the RCN. Furthermore, instead of focusing on the development of resilient strategies, the RCN is now more concerned with supporting groups of cities within the network on self-identified priorities.

Although none of the three networks has the hierarchical authority to force members to act, local climate action has increased in all of them over time. The development of the CoM has been described as a "two-speed climate action process" because compliance is much higher in larger cities and in municipalities located in northern and central Europe (Rivas et al. 2022). The CA provides monitoring tools and supports its members to establish monitoring systems, but reporting is not required, and there are no sanctions in case of noncompliance. Compliance seems to be higher in monocentric networks with quasi-hierarchical features, such as 100RC. However, the RCN has loosened its uniform approach and now relies on more decentralized solutions. Overall, 100RC shows the fewest, and the CA the most, polycentric features due to the high degree of autonomy of its members (see Table 3 and Figure 1).

Governance with Networks

Not only does the CA facilitate knowledge transfer between its members but it has also collaborated extensively at the system level with other municipal networks, nonstate actors (such as environmental NGOs), and governmental agencies, thereby building on its initial cooperation with indigenous groups in the Amazonas region (Climate Alliance 2020, 2021). For example, instead of competing for external funding, the CA joins forces with other organizations and applies for joint projects (often nationally or EU funded). It has run numerous EU-funded projects (Climate Alliance 2023, 53–56) and opened an office in Brussels in 2007, which serves as a contact point for members and facilitates direct lobbying of and collaboration with EU institutions. The Declaration of

Wels (Climate Alliance 2021) emphasizes strong alliances and global partnerships. Additionally, the CA has been involved in managing the CoM, which has been run by a meta-network of TMNs since its inception in 2008. The CA has been a central part of this "network of networks" from the outset, which requires close collaboration between all consortium partners on a daily basis.

The CoM frequently collaborates with EU institutions and has become embedded in EU multilevel governance (Kern 2019). This is a unique multilevel arrangement that involves close collaboration not only between all networks[5] running the CoM Office but also between the networks, the European Commission (which funds the operation of the CoM Office), and the JRC as a monitoring agency (Kern 2019, 2023; Kona et al. 2021; Rivas et al. 2022). In addition, among the covenant coordinators and supporters are many governmental organizations and NGOs. Another indication for the CoM's high degree of collaboration with other organizations is the fact that it merged with the Compact of Mayors in 2016. This merger was the best option for the CoM to create the largest global coalition of cities committed to climate leadership and to develop a harmonized monitoring system (Bertoldi et al. 2018; Joint Research Centre 2020, 2022, 2023).

Whereas 100RC cut ties with other TMNs, such as the ICLEI, with which it collaborated for implementation (Coppola et al. 2020), the RCN now works again with the ICLEI in a strong partnership. However, the RCN is not collaborating with other TMNs that focus on resilience (such as C40), due to differing member city sizes and the fact that it adopts a broader, more systemic definition of resilience than other networks. Although the RCN recognizes that national governments provide useful funding opportunities and influence urban policies, it does not provide support to help member cities access this funding or lobby for national policy changes. Nonetheless, political commitment to the RCN from powerful regional policymakers has increased over time. In 100RC, a strong focus was put on business partners (Nielsen and Papin 2021), which has now, in the RCN, shifted toward international organizations and initiatives, such as Making Cities Resilient by the United Nations.

Levels of external collaboration with other municipal networks, governmental organizations, and NGOs are high for the CA, which collaborates closely with other organizations, particularly in the context of the CoM, leading to increasing embeddedness in a polycentric "network of networks." This also applies to the CoM, which is run by a consortium of TMNs and associations of local authorities, has set up networks of covenant coordinators and covenant supporters, and even merged with the Compact of Mayors. While the organizational structure of 100RC focused primarily on the collaboration with business partners, the RCN seems to have a more open approach to collaboration with

5. The CoM Office is operated by a consortium that consists of Energy Cities, the CA, Eurocities, the European Federation of Agencies and Regions for Energy and Environment (FEDARENE), ICLEI, the Council of European Municipalities and Regions (CEMR), and an information technology company (Akaryon).

other TMNs than its predecessor. Table 3 summarizes our findings for the evolution of the three networks regarding the governance dimensions over time. Figure 1 presents these dynamics and the spectrum between polycentricity and monocentricity in a three-dimensional diagram.

Discussion

With respect to our three dimensions of governance, the three TMNs analyzed in this article have moved along the polycentric–monocentric spectrum in different ways. Research has shown an overall trend toward top-down-initiated, more exclusive and externally funded networks (Nielsen and Papin 2021). However, the development from 100RC to the RCN shows a trend toward a stronger bottom-up approach at the membership level, which is also reflected in the institutional changes of the network. Overall, 100RC/RCN is the most dynamic and the CA the most stable network.

More generally, our findings suggest that TMNs may become more polycentric over time in response to external and internal drivers, as depicted in Figure 1. While the CA was located within the polycentric area at its creation, and stays within this area (moving from 1 to 2 in Figure 1), 100RC was in the monocentric area initially, but after reorganization, the RCN moved toward the polycentric corner (moving from 5 to 6 in Figure 1). Overall, the three TMNs converge to a certain degree along our governance *of* and governance *with* dimensions but remain quite far apart from each other in terms of governance *by* (see Figure 1).

There are trade-offs between the three dimensions of governance. For example, our comparison between the CA and 100RC shows a trade-off between the governance *of* and governance *by* dimensions (see Figure 1). This is because a disaggregated organization that involves autonomous members in decision-making may lead to noncompliance, whereas monocentric structures may result in a loss of members or pressure to reorganize the network.

There are also trade-offs between the governance *with* dimension, on one hand, and the governance *of* and *by* dimensions, on the other. In 100RC, a strong central authority limited the openness for collaboration with other TMNs and governmental organizations at the system level, while the CA's decentralized structure facilitates collaboration (see Figure 1). The CoM seems to be in the best position to find a balance between the three dimensions of governance. For the governance *of* and *by* dimensions, the CoM reached a medium, and with respect to the governance *with* dimension, even a high score (moving from 3 to 4 in Figure 1).

Our findings suggest that more polycentric networks along the governance *of* dimension, such as the CA, require a certain degree of central coordination to balance the autonomy of members. Lower scores in this dimension suggest the need for a shift toward more self-organized internal decision-making, which takes greater account of members' interests, as we have seen with the transition

from 100RC to the RCN. Governance *by* TMNs is highest in networks that seek to enforce compliance. The CoM and RCN lie in between the CA as the most polycentric and 100RC as the most monocentric TMN along this dimension. In the absence of coercion, polycentric networks need to develop positive incentives for joining the network and comply with rules and overall network goals. In the governance *with* dimension, the CA scores much higher than 100RC, with its strong focus on business partners. This governance dimension is also high for the CoM, which is open to collaboration with different types of partner organizations.

Conclusions

By focusing on three elements of governance—internal decision-making at the network level, steering and enforcement at the membership level, and openness to collaboration with other actors at the system level—we present three dimensions of TMN governance (respectively, governance *of*, *by*, and *with*) that can help us to examine, assess, and understand governing arrangements better. Focusing on how three selected TMNs have evolved, we applied these dimensions empirically to illustrate their degree of polycentricity over time. While our study was restricted to examining governance relating to TMNs, we suggest that our three dimensions of governance may provide useful lines of inquiry for scholars wishing to gain a greater understanding of how governance operates in transnational network organizations, such as transnational certification systems. More research is needed to fully assess the implications of our tridimensional governance approach and thereby paint a more nuanced picture of network governance. This may help us to better understand whether and to what extent the characteristics of transnational network organizations can contribute to governance outcomes and impacts and to assess the overall impact of TMNs on global climate governance.

Our study also highlights the need for further research on TMN governance. First, most research on municipal networking has focused on individual TMNs, such as C40 or the ICLEI. Our study shows that a comparative approach that also takes the evolution of TMNs over time into account may offer more insights on how TMNs operate. Second, there are still research gaps with respect to the trade-offs between the three dimensions of TMN governance. A more open approach to collaborating with external actors could weaken the agency of individual networks, leading to cities questioning the value of their membership and ultimately leaving the network. Third, there is also a need to investigate the coexistence and complementarity of networks, for example, between inclusive networks, such as the CoM, and exclusive networks, such as the recently established EU City Mission (EU Mission on 100 Carbon-Neutral and Smart Cities by 2030; European Commission 2022). This coexistence may help to avoid two-speed processes and provide new avenues to overcoming the trade-off between the effectiveness of monocentric networks and the self-organization and collaborative potential of polycentric networks.

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