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Guest editorial

Learning in urban climate governance: Concepts, key issues and challenges

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1 Introduction

It is widely acknowledged that cities hold a key position in climate change mitigation and adaptation (Dent et al., 2016; McPhearson et al., 2016). According to current estimates, cities produce around two-thirds of total global greenhouse gas emissions, and account for a similar proportion of total global energy consumption. Equally, it is in cities where climate change impacts (e.g. heatwaves, flooding, heavy rains, sea-level rise) are expected to cause the most severe damages (ICLEI, 2014; C40, 2017). In addition, future urbanization will only heighten the importance of cities under climate change (UN DESA, 2014). There is enormous potential for effective climate change responses in and through cities, but this requires a range of profound institutional, behavioral, technological and physical changes (Hayden, 2014; Mathews, 2015).

The recognition of cities as strategic arenas where urban governance and climate change governance become necessarily intertwined has triggered a flourishing body of research (Betsill and Bulkeley, 2007; Mc Carney et al., 2011; Bulkeley, 2013). This research has illustrated how climate discourses indeed shape a diversity of new governance arrangements, altering the way in which public authorities (across all levels), businesses, civil society, third sector and academia engage in urban policy making and implementation (Bulkeley et al., 2011; Gollagher and Hartz-Karp, 2013; Holley et al., 2012; Knieling, 2016). It has also revealed how urban climate governance frequently extends beyond national boundaries, involving international and translocal actor relations (Homsy and Warner, 2015; Johnson et al., 2015). This is particularly evident in the emergence of transnational municipal networks focusing on climate action (Kern and Bulkeley, 2009; Lee, 2015), in which cities increasingly act collectively, motivated by criticisms of nation state inertia, and claiming the right and obligation to take the lead (Barber, 2014, 2017).

Several key issues have surfaced in this debate. Firstly, urban climate governance shifts reflect the emerging *politics of mitigation and adaptation*, with potential winners and losers at different scales (Bulkeley and Betsill, 2013; Bulkeley et al., 2014; Hughes, 2017). Conflicting actor strategies are arising, drawing on the cognitive and normative reorientations provided by concepts such as “low-carbon”, “transition”, “resilience” or “decoupling”. More often than not, however, these tend to defend local prosperity and resource securitization, considering that e.g. the C40 agenda has been criticized as “neoliberal and technocratic” (Davidson and Gleeson, 2015), but some also pursue community autonomy and sufficiency, reflecting rather different possible valuations in terms of social justice and ecosystem health (Bradford, 2016; Brown et al., 2012; Castán Broto, 2017; Hodson and Marvin, 2014).

Secondly, urban climate governance innovations appear to draw on an extended set of *policy instruments* that mirror the particular interests, coalitions and mobilization strategies at play. This often

implies a move beyond incentives, requirements and enforced compliance to include also different types of informational, deliberative and/or collaborative formats and techniques – yet, frequently targeting acceptance for incremental and engineered solutions, rather than social innovation (Bulkeley, 2010; Castán Broto and Bulkeley, 2013; van der Heijden, 2014, 2017a; Knieling, 2016)

Thirdly, a proliferation of urban climate *governance experiments* has been acknowledged, tracing especially their design characteristics and partly also politics (Bai et al., 2010; Boyd and Ghosh, 2013; Chu, 2016; Cloutier et al., 2015; Karvonen and van Heur, 2014; McGuirk et al., 2015; Smedby, 2015; van der Heijden, 2016). New stakeholder interactions, instruments and institutional arrangements have been conceived to test and assess practical performance for a limited time period, at least initially, and to draw lessons regarding wider replication and/or upscaling (Castán Broto and Bulkeley, 2013; Evans et al., 2016; Kivimaa et al., 2017). Most importantly, policymakers, practitioners, and academics alike continue to express strong hopes regarding these governance experiments, in particular with a view to *learning* how to cope with the mitigation and adaptation challenges faced.

However, stakes are high in urban climate governance, demanding cautiousness about these expectations and underlying assumptions of innovation, especially considering the inherent challenges regarding politics and policy design noted above. Deep transformations are required in the cultures, structures and practices underpinning current urban systems and their climate related performance (Droege, 2008; McCormick et al., 2013; Frantzeskaki et al., 2017; Wolfram et al., 2017), and the time window available for effectively undertaking these encompassing changes is short (IPCC, 2014; Sanford et al., 2014). This suggests a need for much more radical governance shifts than those observed empirically so far. In addition, a focus on (local) showcase innovations such as living labs or pilot projects also runs the risk of neglecting much broader trends in multi-level and multi-scalar urban climate governance, occurring through a range of more ‘profane’ novelties and modifications that equally affect how cities and urban stakeholders learn about collective responses to climate change, such as community development, competitive awards, policy advisory boards, best practice promotion, city partnerships and networking, among others. Taken together, however, these may well provide for a more substantive leverage to enable change.

We argue, that closer scrutiny is required in terms of the learning processes involved in climate-driven urban governance innovations in order to avoid any premature and normative interpretation of patterns, and to better understand the ways in which learning influences shifts in urban governance (cf. Smedby and Quitzau, 2016; Wamsler, 2016). Key questions relate to the types of actors involved, what exactly they learn and how, and the particular ways in which their learning reshapes governance practices. Most importantly, this may also enable further insights regarding expected learning outcomes - e.g. from adopting novel management techniques to altering deeply held individual and collective beliefs. This special issue takes up these questions focusing on *governance learning* as a vital perspective for future urban climate governance research.

2 Conceptualising governance learning

The literature on urban governance responses to climate change has increasingly underlined the central importance of learning, since it influences how actors search, review, conceive of, and adopt new forms of interaction, decision-making processes and policy instruments to govern urban climate change in novel ways (Lee and van de Meene, 2012; Harman et al., 2015; Knieling, 2016; McFarlane, 2017). This concern for learning derives especially from the perceived turn towards experimentation in urban climate governance, seen through the lens of system innovation approaches such as transition

management or adaptive governance and their emphasis on experiential learning-by-doing and doing-by-learning (Rijke et al., 2012; Chaffin et al., 2014; Loorbach, 2014). It is equally driven by the growing attention to the role of city networks and the extended opportunities for transnational knowledge transfer they imply (Gordon, 2016; Kern and Bulkeley, 2009; Lee, 2015).

However, *governance learning* remains a major gap in current theorizing, favored by two related challenges. On the one hand, governance, understood as collective decision making for societal problem solving (cf. Rhodes, 1996; Stoker, 1998; Kooiman, 1999), by necessity involves diverse actors in the public, private, civil society and third sectors, and thus defies a focus on a single learning subject (e.g. *government*). On the other hand, characterizing governance requires accounting for particular configurations of polity, politics and policy - or *modes* of governance (Lange et al., 2013). However, most established concepts in the literature on learning processes in societal problem solving focus on only one of these governance dimensions, e.g. “policy learning” (Sabatier, 1988), “policy transfer” (Dolowitz and Marsh, 1996), “lesson-drawing” (Rose, 1991), or “government learning” (Etheredge, 1985). A recent review of the literature on learning in environmental problem solving also recognizes this conceptual fragmentation (Gerlak et al., 2017), as the corpus analyzed invokes not less than 32 unique theoretical frameworks for understanding learning, with “social learning” being the most common by far (50%)¹. In addition, it also identifies a wider gap in theorizing since over half of the references do not have any explicit theoretical approach for studying learning (ibid.).

Considering that governance embraces different dimensions of the governing process (polity, politics, policy), governance learning cannot focus on any one of these alone. Rather, it needs to account for changing governance modes as a result of stakeholder interactions. This perspective of the governing process itself as learning corresponds to notions of “social learning” (Hall, 1993), acknowledging that “much political interaction has constituted a process of social learning expressed through policy” (Heclo, 1974, p. 306). More recent definitions of social learning share this focus on interaction forms (cf. Gerlak et al., 2017). For instance, Keen et al. (2005, p. 4) suggest, social learning refers to “a process of iterative reflection that occurs when we share our experiences, ideas and environments with others”, and Ducot (2009, p. 240) adds that it “not only refers to the sharing and integration of knowledge through enhanced communication between actors but to inter-relational learning and the consolidation of social networks oriented toward action through the development of collective activities and relational practices”. In this sense, we understand governance learning as a situated social learning process, emergent or planned, in which various stakeholders of the system(s) governed interact in response to a given societal problem (such as urban climate change mitigation and adaptation), and thereby modify previously established modes of governance in terms of polity, politics and/or policy.

In order to identify and describe characteristics of governance learning, we draw on Bennett and Howlett's (1992) three explorative questions about policy learning as a basic heuristic, but adding a fourth question that accounts for the particular interaction forms involved. First, an exploration of governance learning practices needs to account for *who learns* and identify the range and type of actors that take part in the process. This necessarily goes beyond government and public authorities, considering the role of e.g. businesses and their associations, NGOs, academia, grassroots initiatives, citizens and intermediaries, acting at and across various scales. Stakeholder participation is an essential

¹ Followed by experiential (17%), organizational/loop (15%), collaborative (14%), policy/political (12%), transformative/adaptive (9%), and instrumental learning (7%).

characteristic since it affects not only the democratic legitimacy of the learning process, but also the diversity and valuation of its knowledge substance.

Second, it requires recognizing *what is learnt* in all three dimensions of governance, identifying e.g. the specific policy instruments, deliberation processes or entire institutional set ups and discourses modified. What is learnt also needs to be traced to its origins i.e. the sources of inspiration or knowledge transfer, since these may be *endogeneous* (learning within the same policy field and jurisdiction) or *exogeneous* (learning from a different policy field and/or jurisdiction), which strongly affects knowledge proximity and diversity (cf. Rose, 1991, 2002; Newig et al., 2016).

Third, an exploration of governance learning strives to understand *to what effect* learning occurs in terms of governance. This is particularly important with a view to its implications for the resulting dynamics of societal change. As McFarlane notes (2011, p. 361), learning is a “process of potential transformation”: “As a process and outcome, learning is actively involved in changing or bringing into being particular assemblages of people-sources-knowledges. It is more than just a set of mundane practical questions, but is central to political strategies that seek to consolidate, challenge, alter and name new urban worlds”. Beyond distinguishing degrees of difference between former and novel practices (e.g. copying, emulation, adaptation, hybridisation, synthesis or innovation - cf. Rose, 2005, p. 80), it is thus crucial to ask in how far governance shifts enable or constrain pathways towards system transformation and sustainability through *integration* (triple-bottom line, policies, agencies, territories, levels), *participation* (inclusion, diversity, transparency) and *reflexivity* (indicators, monitoring, iteration, joint appraisal) (Lange et al., 2013; Meadowcroft, 2013; Newig et al., 2013). Referring to the widely used distinction between single-, double-, and triple-loop learning (Argyris, 1999; Bateson, 2002) clarifies that changes in these aspects can reflect the *depth of governance learning* i.e. in how far learning has effects only on the instruments and techniques used (single-loop), or also on actor coalitions, strategies and approaches (double-loop), or even on deeply entrenched paradigms, institutions and practices (triple-loop) (Reed et al., 2010; Johnson et al., 2015, p. 237). The latter closely corresponds to the notion of transformative learning (Forester, 1999; Loeber, 2007), which additionally underlines that triple-loop social learning needs to be *situated*, stressing the importance of context, personal exchange and learning-by-doing as critical conditions. In order to have transformative effects, governance learning thus needs to be (come) an embedded process (cf. McFarlane, 2011).

Fourth, as recognized above, the study of governance learning needs to account for the different *interaction forms* involved. A first fundamental distinction that should be made in this regard concerns the temporal structure of the learning process. Governance learning may be *sequential* i.e. based on previous governance experiences, or *parallel* i.e. drawing on simultaneous and ongoing governance practices. This has important implications for the depth of learning since a sequential process constrains feedbacks and variation, and thus a deeper questioning of structures and paradigms. Further important characteristics can be derived from the scholarship on sustainable environmental governance (Keen et al., 2005; Pahl-Wostl et al., 2008; Collins and Ison, 2009; Wals, 2009; Tàbara et al., 2010; Siebenhüner et al., 2013; Ison et al., 2015) and reflexive governance for socio-technical transitions (van de Kerkhof and Wiczorek, 2005; Voß et al., 2006; Foxon et al., 2009; Schutter and Lenoble, 2010; Newig et al., 2013). This work underlines a set of principles that can be used to scrutinize the interaction forms adopted in practice, in particular a) integrated knowledge co-production (inter- and transdisciplinarity), b) foresight and anticipation of long-term systemic effects, c) iterative and participatory goal formulation, and d) adaptive planning and interactive, emergent and bottom-up strategy development. Such principles strive to enable deeper learning with a view to question and transform firmly established structures, cultures and practices at individual, organizational and societal levels (Spangenberg, 2011).

With a view to learning, these insights have been further distilled in the recent literature on experimentation as a mode of governance for addressing complex (urban) sustainability challenges (Evans et al., 2016; Sengers et al., 2016; Ansell and Bartenberger, 2016; Heiskanen et al., 2017). It examines more specifically how different forms of experimentation and the interactions they imply are generative of different types of learning outcomes, and regarding the achievable depth of learning, in particular. Therefore, we adopt another basic distinction for discussing governance learning based on the typology suggested by Ansell and Bartenberger (2016)², considering whether learning occurs in *controlled processes* i.e. mainly based on cause-effect analysis (e.g. in test-beds, randomised controlled trials), or *open processes* i.e. drawing on transdisciplinary and iterative problem-solving (e.g. through Living Labs, citizen science) (cf. Nevens et al., 2012; Wiek and Kay, 2015; Bela et al., 2016). In practice, controlled and open processes form opposite ends of a continuous spectrum along which interactions in governance learning may occur. The degree of openness and diversity in terms of knowledge co-production they entail is independent from a sequential or parallel process organization, and may also draw on both endogenous and/or exogenous sources.

Finally, the heuristic derived above implicitly raises the question whether certain governance learning processes or their combinations are perhaps more desirable than others to support transformative change for sustainability (cf. Ansell and Bartenberger, 2016)? Considering the ongoing proliferation and diversification of urban climate governance innovations, there is clearly a need for practices striving to identify, compare and assess different governance learning strategies and pathways, allowing stakeholders to learn from these and enhance transformation. Therefore, in order to move beyond an account of individual governance learning episodes it seems essential to ask additionally in how far governance learning processes are *themselves* in practice a subject of learning, i.e. if, where and how *meta-learning* occurs. Conceptually, such a notion of meta-learning as structured “learning from learning” is well established in studies of organization management and artificial intelligence (Lundberg, 1995; Vilalta and Drissi, 2002). More importantly, it fully aligns with the concept of meta-governance i.e. “the organization of self-organization” (Jessop, 1998, p. 42), or defining the values, norms and principles of governance, for which in turn institutionalized social learning has been recognized as a key condition (ibid., Jessop, 2003; Kooiman and Jentoft, 2009). Regarding the empirical findings presented in this issue, the question of meta-learning emerges as a key future challenge since corresponding practices or institutions are hardly identified, although relevant lessons seem tangible (e.g. regarding complementarities and synergies between different types of governance learning processes).

In sum, the heuristic we adopt here for exploring governance learning across the contributions contained in this issue asks for the *actors* involved, their *sources* of learning (endogenous/exogenous), the basic *interaction process* features (sequential/parallel, controlled/open), and the emergence of governance *meta-learning* (Fig. 1). A final caveat should be placed though regarding a possible (mis-)understanding of governance learning as a normative concept. As the policy-oriented learning literature illustrates, some conceptions of learning have indeed become increasingly normative in their interpretation, postulating learning as a positively valued process and outcome of governing activities. This is the case especially for social learning, which in addition appears to be the prevalent concept in current debates (cf. Reed et al., 2010; Gerlak et al., 2017, p. 13). However, this is problematic in as far as it disregards the possibility of collective learning that leads to rather *undesirable outcomes* for society - a possibility that in fact may have a high probability, considering e.g. current insights from the urban climate governance

² The “Darwinian” mode of experimentation (based on variation and selection) identified by Ansell and Bartenberger (2016) can also be understood as a combination of a *parallel* learning process with *controlled* and/or *open* learning.

literature (see above). Therefore, we recognize the ambiguity of governance learning effects, acknowledging that “learning itself is a neutral process, which begs, in any particular case, valuative questions of context and intent” (Sterling, 2011, p. 18).

Figure 1: Typology of modes and sources in governance learning

3 Overview of contributions

This special issue features eight papers brought together through the EU COST program (European Cooperation in Science & Technology) ‘Innovations in Climate Governance’ (INOGO; www.inogov.eu). The INOGO program aims to identify innovative forms of policy and governance for climate change, where and how these have emerged, and how they are diffused across time, space and different modes and levels of governing. The selected papers were presented at an INOGO workshop held at the University of Amsterdam on September 22nd-23rd 2016. The workshop sought to map, explore and interrogate examples of innovative and experimental urban climate governance across the globe.

The selected papers range from case studies of shallow or deeper urban climate governance learning processes within a single country towards studies of international exchanges among cities through bilateral cooperation, and finally also through different influential transmunicipal networks. In this, they draw on a diversity of empirical material, epistemologies and methods that offer complementary but also corresponding insights about the particular places, arenas and mechanisms of urban climate governance learning across authority levels, sectoral boundaries and spatial scales. The resulting picture is one that puts the frequently reiterated discourse of cities as leaders for transformative climate actions into perspective, while also acknowledging for the potential that does exist. To address the latter, the various deficits identified point to concrete options for future research and intervention that may help to reverse current trends.

(Author 2, 2018) look at the urbanization hot-spot China, questioning current approaches to climate adaptation in cities and the instances of governance learning they imply. Focusing on the severe flood risk challenges faced by cities in the Pearl-River Delta as a critical case, the authors examine the institutions, interests and ideas that appear to shape current responses across government levels. In result, they recognize that despite the absence of local adaptation discourses, approaches or strategies, sporadic projects do appear to incorporate novel adaptation solutions. Yet, these are justified by place-marketing arguments instead of climate change. Key factors that explain this pattern are identified in the restrained collaboration across policy fields, incentives for local governments and mayors to prioritize short-term urban growth over long-term climate adaptation, a low level of local stakeholder awareness and valuation of urban climate resilience, and the neglect of available local knowledge in coping with flood risk. Therefore, governance learning has hardly occurred in practice so far. Yet, the authors also identify opportunities for this to happen, especially linked to the heterogeneous local adaptation projects implemented in parallel, and a recent national pilot program. Meta-learning seems indicated especially in terms of sectoral policy coordination, public-private sector partnership and civil society participation, but would clearly require a dedicated multi-level approach.

Delving into the rather different cultural and institutional context of the US, (Author 3, 2018) then discusses how the specific political ecology of a city matters when it comes to urban climate governance and associated learning processes, both locally and across scales. By conducting an in-depth historical institutionalist analysis of the two extreme cases of Portland and Phoenix, the author illustrates how the

specific geography and foundational logic of these cities has over long periods of time contributed to shape equally specific governance modes for addressing climate change adaptation and mitigation, with paradoxical outcomes in terms of governance learning. In Portland, stakeholders have co-developed a reflexive and participatory approach that leads to deep learning and transformative outcomes at the institutional level. In contrast, Phoenix exercises climate governance in a rather authority-led and expert-driven way that limits learning to technology and policy designs. However, given the specific critical climate challenges faced by the two cities, and by other cities in the US or globally, those being addressed in Phoenix (drought, energy scarcity, heat island, environmental refugees) are more urgent and comparable, even though Portland's approach is more bold and progressive. This raises important questions both in terms of strategies and interventions that could guide meta-learning processes, as well as for leveraging local climate governance innovations in laggard cities. For the latter, the author recognizes that especially local universities and their sustainability expertise appear to play a decisive role in terms of knowledge provision, intermediation and leadership.

(Author 4, 2018) extends this discussion of urban climate governance learning paths in a given national context through a comparative in-depth case study of three South Korean cities, focusing on the energy domain as a critical mitigation lever. Drawing on the system theoretical concept of transformative capacity, the author examines the degree to which key capacity development factors are currently articulated in Changwon, Gwangju and Seoul. Through a differential assessment undertaken by both stakeholders and researchers he recognizes significant variations in the way how urban energy governance becomes modified with reference to climate change. Especially transformative and polycentric local leadership, policy experimentation, empowered communities of practice, as well as international exchange and knowledge transfer are key factors that provide Seoul with a higher capacity to effectively transform its centralized and fossil/nuclear- based energy system. By contrast, both Changwon and Gwangju show substantive capacity deficits, reinforced by a stronger alignment with national policy orientations and support. Across all three cities studied, major capacity gaps also remain in terms of developing systems approaches, sustainability foresight and social learning processes. These findings illuminate how place-specific constellations of interdependent capacity factors may either enhance or constrain the depth of urban climate governance learning processes, underlining the importance of open learning modes and exogenous sources. At the same time, however, they also shed a critical light on how national policy can heavily condition these factors and prevent effective meta-learning.

(Author 5, 2018) then turns towards existing practices of national meta-learning and questions the largely taken for granted role of “best practices” as a policy instrument for supporting the diffusion of innovative climate governance solutions. By examining a large national funding program for municipal climate action in Germany, meant to generate success cases for wider replication and upscaling, the author first illustrates how the governmental rationality of this program aligns with entrepreneurial approaches such as new public management, but also with transition management and its reliance on scientific procedures for generating and diffusing innovations. Following an understanding of “best practices” as a governmental technology she then unpacks how the reality of learning on the ground deviates from the programmatic expectations and intentions. While actual replication turns out to be the exception, best practices appear to fulfil a set of important governance functions, largely ignored by the programs that create them: They primarily serve to enable collective action in a contested new domain, to set agendas and influence policy-making in multilevel contexts, as well as to profile a city for place-marketing. In turn, key requirements that local stakeholders articulate for effectively learning from best practice such as lessons from failures, barriers, conflicts and ways to overcome these are not attended since such knowledge is neither collected nor shared systematically. These findings underline that

contrary to wide-spread expectations, “best practices” in their current instrumental form may contribute very little to the diffusion of urban climate governance innovations, but instead constrain deeper social learning processes. They also point to the critical need for a meta-learning perspective that could help to overcome some of the deficits embedded in the governmental rationality of best practices.

(Author 6, 2018) examines how governance learning occurs as part of international city-to-city (C2C) co-operations in the climate policy domain, considering the frequent leader-follower constellation among the cities engaged. His case study of Tel Aviv and its C2C co-operations with Berlin and Freiburg respectively illustrates how such learning remains largely sequential and shallow (single-loop) with the follower city selectively adapting novel approaches and ideas for its own local urban climate governance from the leader city in an open and unstructured process. Governance learning is especially triggered through personal experiences and exchange during site visits, which do enable to question established cognitive and normative frames. Yet, it then depends on individual leadership and policy entrepreneurs, as well as intermediaries for translating and reframing governance lessons from abroad for local stakeholders. At the same time, C2C cooperation may also offer windows of opportunity to move from single- to triple loop learning if more open and participatory arenas are created that allow stakeholders to experiment with new modes of governance and knowledge co-creation including civil society and science. It may also drive meta-learning in the national context of the follower city to the degree that it becomes positioned and/or reinforced as a domestic leader.

(Author 7, 2018) explore how urban climate governance learning occurs in cities engaging in transmunicipal networks (TMN), taking the “100 Resilient Cities” network as a case in point. Drawing on institutional learning and network governance theory, the authors show how the learning processes they observe in Rotterdam and Berkeley strongly involve path dependent contentious urban politics: Local institutions, shaped by the cities political ecology and economy, confront the concepts and institutional novelties promoted by the TMN. This illustrates that governance learning driven through a TMN necessarily involves political contestation as impacts of new knowledge and practices on diverse vested interests become assessed and interpreted by local stakeholders. The authors also acknowledge for the enabling role of leadership and institutional entrepreneurs, but critically question the ability of TMNs to influence governance learning beyond the city boundaries as interactions are limited to their members. Therefore, they emphasize that inclusion and transparency as well as more open and parallel modes matter in order to strengthen the depth of governance learning. This may enable more substantive changes in partnerships and coalitions, in pathways of knowledge diffusion and adaptation, as well as in the methods used for framing, designing and implementing policy.

(Author 8, 2018) continue this critical investigation of governance learning practices in TMNs by looking at the C40 Cities Climate Leadership Group. Based on a conceptual distinction between climate actions with an orientation at incremental, reformistic or transformational change, the authors ask what type of governance lessons are actually promoted and diffused through the network? By analyzing the agenda of the C40 organization itself, as well as a stratified sample of climate strategies developed by member cities, they find strong similarities between actions, most of them pursuing incremental or reformistic adjustments focused on technology and infrastructure. By contrast, the institutional shifts and learning modes (parallel, open) that transformative actions would require are only exceptions. Their results also point to differences between cities in more and less carbon-intensive economies (“global North/South”) with the latter showing much lower ambitions for transformation. This suggests that while urban climate governance learning in the C40 network remains strongly conditioned by the political ecology and -economy pathway of a city, it is equally dominated by sequential and controlled learning modes (comparing a canon of technical measures with a proven cost-benefit ratio), mainly drawing on the same policy fields for mitigation and adaptation (endogenous sources: energy, transport, housing, green space,

flood protection), yet inspired by examples elsewhere (exogenous sources) – which reduces the role of the network to providing additional legitimacy and justification for the implementation of local “business-as-usual” strategies.

Finally, (Author 9, 2018) provides further insights into the particular interaction patterns within transmunicipal networks that (could) enable governance learning. He uses social network analysis to deeper explore the relationships that members of the C40 network maintain among each other, focusing on the role of socialization, learning and collaboration. Drawing on a survey responded by city officials, the author concludes that informal activities (i.e. socialization) among network members require more attention because they are closely correlated to their learning and collaboration activities, and also more frequently undertaken, with the former influencing the latter. Moreover, cities with a higher degree of network centrality realize higher benefits from transnational municipal networks than those on the network periphery. This suggests the need for strategies to combat inequality in emerging global environmental governance forums and networks. It also raises the critical questions whether governance learning through city networks tends to occur in a top-down manner rather than as a social process since other local stakeholders are not necessarily involved, and whether meta-learning is biased by the network’s centrality pattern defining *whose* governance lessons experience broader diffusion.

4 Key issues and findings

The papers selected for this special issue thus shed light on a variety of ways in which governance learning occurs or is hindered, particularly regarding the type and range of actors involved, the kind of interaction processes in which they engage, and the sources of learning used. They also reflect emerging limitations of and opportunities for governance meta-learning at national and transnational scales. Across the cases and contexts analyzed, we recognize the following issues to be of critical relevance for understanding and influencing urban climate governance learning:

Key factors shaping local and multi-level learning pathways

Urban climate governance learning processes are embedded in existing patterns of ecosystem service exploitation and economic wealth creation that mark the foundational logic of cities. This highlights the fundamental role played by the *political ecology and economy of cities* in shaping their ability to unlearn currently prevailing ways of thinking, doing and organizing. Urban governance institutions are created and recreated over long periods of time, resulting in strong path-dependencies that condition place-specific orientations and practices (Author 3, 2018). This is not only reflected in the approaches set up among local actors, but also in how far national and/or transnational relations can trigger either political contestation or collective reflexivity (Author 4, 2018; Author 6, 2018; Author 7, 2018).

A number of cases shows how mitigation and adaptation are seen as opportunities to *protect and reinforce existing systems*, rather than as an attempt to transform them (Author 4, 2018; Author 5, 2018; Author 8, 2018). This underlines that cities that are currently (self-) portrayed as climate leaders are those with the highest stakes in securing resources and reducing vulnerabilities *locally* to sustain their economies, power and lifestyles. Such “insular accumulation strategies” (Davidson and Gleeson, 2015, p. 27) illustrate the critical meta-learning deficit in urban climate change governance *beyond the city* that would have to address key questions of environmental justice in urban regions, nation states and across the globe, while putting the power of individual cities to change trajectories into perspective (Barber, 2014, 2017; Schragger, 2016).

These issues further underline the implicit *politics of urban climate change governance*, and thus the question of who gets involved and how in learning processes. Climate change poses significant threats to diverse vested interests in urban spaces, whilst simultaneously there is a growing community awareness of its impacts on social needs and quality of life. While levels of participation differ considerably between countries, this basic constellation increasingly challenges existing power positions and actor relations (Author 2, 2018; Author 7, 2018). Moreover, this applies not only locally but also across scales of governance, as e.g. nation state intervention (or non-intervention) exerts a major influence on public and private actor motives and choices, but resonates with the national accumulation regime and innovation system – not necessarily with local community needs. This demands multi-level learning processes that strengthen inclusiveness and transparency, as well as knowledge diversity.

However, the default learning modes observed throughout the papers appear to be more *controlled, sequential and based on endogenous sources*, while using wider participation mainly for the purpose of creating awareness and acceptance. Again this challenges the dominant narrative of cities as forerunners, but aligns with the above conditions that favor incremental adjustments to avoid radical systemic shifts (see also Johnson et al., 2015). Exogenous sources of learning are thus used rather selectively and for the justification of established priorities, whereas emerging alternative modes (open, parallel) and a deeper engagement with exogenous sources only occur if driven by particular forms of agency (see below).

In this, *socialization and informal personal exchange* are underlined as a critically important condition for moving towards deeper governance learning (Author 5, 2018; Author 6, 2018; Author 9, 2018). There is a strong need for trusted relations, as especially powerful actors, are more reluctant to engage in radical shifts and experiments. Yet, at present the role of socialization in bridging these gaps appears to be insufficiently recognized or left to arbitrary circumstance. This points to an opportunity for designing more strategic approaches to urban climate governance (meta-) learning that balance formal and informal processes.

Key forms of agency and its conditions

Political leadership continues to play a crucial role (cf. Castán Broto, 2017; Gupta et al., 2015; Haus and Erling Klausen, 2011), with mayors and their political orientations as both key drivers and barriers for governance learning. The case studies illustrate the pivotal role of the direction and support that mayors can (but not always do) provide to enhance and deepen such learning processes. Political leaders appear to lack suitable networks for sourcing ideas regarding governance innovations and how to guide them as they often depend on senior officials and corporate expertise, but remain disconnected from local innovation communities. This requires more collaborative forms of policy making (cf. Torfing and Ansell, 2017) and thus also more open and parallel modes of governance learning, working with variable constituencies.

Various papers also illustrate how other local champions can have equally strong influence on governance learning. *Institutional entrepreneurs* such as the Chief Resilience Officer (Berkeley, Rotterdam), the head of boundary-crossing departments (Portland, Tel Aviv), or renowned academics (Portland, Seoul) can foster the reshaping of current interaction forms and rules, as well as organizational configurations - but this depends on trusted relations and the (long-term) stability and legitimacy of their position (cf. Castán Broto, 2017; Kalafatis and Lemos, 2017). Furthermore, *intermediary bodies* such as local universities, NGOs or semi-public entities are critically important to translate knowledge and interests, facilitate dialogue and support reflexivity (e.g. assessment), but depend on similar preconditions to enable governance learning (cf. Kwon et al., 2014; Rauken et al.,

2015; Siddiki et al., 2015). In addition, through the emergence of *community climate activism* there are also new demands regarding participation in climate governance based on alternative values. Such community activism thus fosters more polycentric leadership and diverse place-based experimentation, but in turn requires empowerment and inclusion (cf. Chu et al., 2016, 2017; Wolfram, 2016).

Meta-learning deficits and opportunities

A key question emerging from the insights provided by the different case studies was in how far governance learning processes become *themselves* a subject of learning i.e. to identify where and how meta-learning takes place - if at all. In this regard, the cases highlight substantial deficits, but also some opportunities for the future.

First of all, meta-learning appears to be enabled or constrained by the *geographical particularity of climate change challenges*. Because urban mitigation and adaptation challenges largely differ between cities and regions, effective learning from urban climate governance lessons strongly depends on the actual similarity of these concrete problems and priorities (e.g. renewable energy supply, water scarcity, urban flooding, heat islands) and their particular politics (actor roles, interests and conflicts) (cf. Bulkeley, 2013; Castán Broto, 2017). This suggests that only where these basic challenges coincide, deeper governance meta-learning can be informed by the diverging polity and policy of other cities.

Second, *city networks and co-operations reflect an implicit leader bias* that influences the conditions for meta-learning. In particular, the center/periphery dichotomy within networks has been widely discussed- (cf. Lee and van de Meene, 2012; Lee, 2015), but a similar effect can be expected in the context of bilateral co-operations, leading to a dominance of lessons from “leader” cities. This bias influences not only the agenda and instruments of the network organization itself, but also its constituent logic. The result is a dominant learning pattern of “followers” selectively replicating “leaders”, which contributes to an overall lack of transparency and insights regarding the governance lessons implied in urban climate “solutions” currently propagated and diffused.

Third, the extent to which meta-learning can take place also critically relies on the *rationality and design of techniques* used to share and diffuse urban climate governance knowledge (van der Heijden, 2017b). The practical implementation of such techniques developed by city networks and states turns out to deviate considerably from their intended effects as they become exploited for disparate local actor strategies (e.g. agenda-setting or place-marketing). Moreover, their design also disregards key stakeholder requirements (e.g. extracting a “toolbox” rather than lessons from failure), which undermines the potential for more effective meta-learning processes. However, nation states, transnational networks or supranational organizations (e.g. EU, UN) could well envisage more suitable meta-learning strategies that counter these trends by focusing on similar climate challenges, related governance shifts and personal exchange.

5 Conclusions and outlook

This special issue raises the question how learning occurs in current urban climate governance, and what implications this may have for the required rapid and substantive changes in terms of mitigation and adaptation. On normative grounds, high hopes have been expressed regarding the capacity of cities - and particularly city governments and other local actors - to take progressive climate action, where nation states and other organizations at national and international level show stagnation. Building on empirical examples from diverse global contexts, including the involvement of international city networks, the eight papers presented here challenge these expectations but also provide partially supporting evidence.

With these contributions, it appears that *governance learning* forms a fruitful perspective for future urban climate governance research. Acknowledging that deep transformations are required in current urban systems to cope with climate change and that the time window available for doing so is short, we argue that a focus is necessary on how particular learning processes challenge, reconfirm or reshape governance structures and practices. All papers in this special issue have critically analyzed the characteristics of such learning processes in rather different constellations of urban climate governance, using a variety of theoretical perspectives and methods. What binds them together is that, while there is no shortage of novel governance arrangements addressing cities and climate change as such, these contribute very little to deeper, triple-loop governance learning.

Before jumping to quick conclusions about the role of cities in global climate governance, these findings urge for nuance and detention. Much can be said in favor of the hypothesis that cities can lead the way: Cities are the level closest to the citizen and have been breeding grounds for new types of climate action leadership and collective agency. They maintain transnational relations to directly exchange about and promote novel urban governance practices. Cities also have a certain room for manoeuvre to walk new ways, using diverse experimental approaches to learn about effective climate change mitigation and adaptation. Yet, as the eight papers illustrate, city action is not straightforwardly path-deviant, or likely to be a panacea for inaction at other levels, pointing to strong dependencies on the political ecology and economy of cities.

Consequently, governance learning results to be constrained by a prevalent combination of modes and sources that clearly limits a substantive progression of beliefs, behaviors, and institutional practices, based on reflexivity about the pathway of the past (cf. Albrechts, 2010). More open and parallel processes juxtaposing endogenous and exogenous sources are required - and also possible, as very distinct cases such as Portland or Seoul illustrate - to gradually overcome these limits. In particular, this implies that the suggested novel perspective of studying meta-learning practices could prove very useful to identify options for enhancing the necessary diversity and depth in urban climate governance learning. We therefore invite future research to assess whether these findings resonate more broadly with other cases and practices, strengthening especially insights from high carbon, climate vulnerable and fast urbanizing regions.

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