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The spatial politics of an urban carbon accounting standard

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Abstract

Recent efforts to disseminate a coordinated, international standard for urban carbon accounting reflect new interests to reframe urban environments as central to global climate goals. Advocates emphasize how local policy based on standardized accounting methods will be more effective and that global knowledge over climate progress will be enhanced. As part of a decentralized international regime, more standardized measurement tools to quantify the effects of local action are seen as central to building the legitimacy of local climate action. However, others express concerns that accountability to global metrics undermines the democratic nature of local action and that the resources required to compile more complex and comprehensive carbon inventories exceed the benefits. This article examines these debates through a spatial analysis of a new urban carbon accounting standard, the Global Protocol for Community-Scale Greenhouse Gas Initiatives (GPC). Two key spatial dimensions are interrogated: the work of the GPC in locating carbon in territorially defined space, and the effects of a common standard in making carbon mobile across geographies and deterritorializing the urban environment as part of an evolving global climate regime. I argue that examining the GPC through a spatial lens makes legible how new dynamics of power and authority are being expressed over urban environments. Following an analysis on the GPC's territorial accounting method, I turn to explore the importance of new scalar relations in elevating the role of urban environments in global politics. Particular attention is given to the popular urban measurement and reporting discourses shared by international urban policy networks that have helped coordinate new global compliance expectations for local governments. The article concludes by discussing important implications to understanding the effects of a standardized measurement framework and considerations for future research.

Keywords

Climate change, environmental politics, multiscalar governance, urban policy, politics of knowledge

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Introduction

During a side event at the Bonn Climate Change Conference in 2012, a pilot version of the Global Protocol for Community-Scale Greenhouse Gas Initiatives (GPC) was introduced to attendees, a product of collaboration between two major urban climate networks: the C40 Cities Climate Leadership Group and ICLEI–Local Governments for Sustainability. The protocol would be fully launched at the Lima 2014 Conference of Parties. Developed collaboratively with the World Resources Institute (WRI) and in coordination with international partners including the World Bank Group, UN-Habitat, and United Nations Environment Programme (UNEP), the new protocol reflected a growing consensus that a common and consistent method of accounting for local level emissions was needed. Michael Bloomberg helped shepherd the project during his tenure as C40 Chair (2010–12) and would support its rapid dissemination through his leadership in establishing a new global meta-network in 2014, the Global Covenant of Mayors (GCoM).[1] The GCoM acts as a coordinating platform for the array of international organizations and networks involved in urban climate action and advocacy. With over 12,500 local government members, the GCoM establishes compliance by ensuring members compile and publicly report a GPC-based emissions inventory. Compliance requirements also include that this inventory is used as the basis for "evidence-based" climate action plans.

Advocates for an urban emissions standard often emphasize how policy based on internationally accepted methods will be more effective, and that global knowledge over climate progress will be enhanced through the reporting of common and consistent carbon data. This shift toward data-driven urban climate governance is equated with making local actors more accountable to climate goals. Monitoring, reporting, and verification practices are pivotal to how a decentralizing climate regime is given coherence internationally, where nonstate/substate action is now seen as central to reaching international goals and more orchestrative strategies of international climate governance seek to take advantage of the "benefits of fragmentation, decentralization, and scale" (Abbott 2012). Urban accounting standards are thus part of the means of diffusing authority and granting legitimacy to urban responses by establishing both procedural and substantive rules (Lin, 2018; Mai, 2018). However, where compliance with shared standards leads to a prioritization of the inventory as the goal, the "accuracy of the data and the amount of resources invested by city governments into contributing to national and global datasets" is also of concern, reflecting a shift in the "site of accountability away from the means and towards the metrics of climate governance" (Hughes et al., 2020: 1086). Thus, while powerful in its normative appeal in that it appears to offer a way out of an ineffectual form of multilateralism, there are obvious democratic legitimacy risks to orchestration through data compliance, in that it operates by instrumentalizing actors and interests that currently occupy different scales and spaces of environmental politics (Dryzek 2013).

This article offers a critical, spatial analysis of the GPC as both a specific method of emissions accounting *and* as a common accounting framework used as the basis for international reporting and compliance. I explore here how power over and within urban environments are established through the development of a new standard based around the rigorous locatability of carbon in urban space. Far from merely acting as a record of the world, accounting is a practice that actively shapes the world around us by rendering the world into a "knowable, calculable, administrative object" (Miller and Rose, 1990: 5). By imposing conceptual boundaries (Hines, 1988) around our knowledge of urban environments and the relationship of urban space to other environmental and political scales, carbon accounting is a productive practice that must be interrogated as part of the means through which knowledge about urban environments is established and new claims over urban environments are made.

The analysis here proceeds in four parts. First, the article offers background on urban carbon accounting as a technical practice and its situation within a much broader emissions accounting

context, offering a historically based examination of why consensus first emerged that a standardized method of urban accounting was needed. In the second section, I discuss the existing scholarship that examines the spatial dimensions of carbon accounting, with a focus on how accounting serves to both fix carbon in space at the same time it enables carbon's freer geographic mobilization. Third, I turn to analyze the GPC and its Scopes Framework as a method that bases its legitimacy on the more rigorous locatability of carbon in and around the urban territorial boundary. Finally, I examine more conceptually the new scalar relations that are produced through the dissemination of a common accounting framework.

My approach offers a critical geography perspective that foregrounds the active making and remaking of spatial relationships through an accounting standard. I argue this approach is useful in revealing how such technical frameworks are actively involved in the transformation of urban environments and the reorganization of power and authority over and amongst scales of climate governance. As Gesing argues of the GPC, these standardization processes are themselves productive as they "produce and reproduce transnational relations" (Gesing, 2018: 130). Rather than simply explain the significance of a standard as the technological means of diffusing international climate norms and principles, a spatial analysis offers a more grounded reflection on how relations of power and authority are produced through the common, calculable entity of carbon. Whereas I draw directly from the GPC's methods in section three, in the final section I explore these rescaling processes as a spatial-theoretical question, in part drawing from policy discourses and best practices disseminated by key urban policy networks and organizations who acts as global advocates for urban climate action in international policy spheres. I discuss in the final section the important implications of this spatial perspective and where further research might continue to explore the issue.

Comparability and consistency: the evolution of a local level standard

Early experiments to devise methods of carbon accounting at the local level first began in the 1990s. As part of a capacity-building effort of early international networks, the focus was on developing relatively simple methods that would make general patterns of emissions from urban infrastructure and activities clearer to local governments thereby helping them to "identify and quantify the most effective opportunities for reducing those emissions" (Kates et al., 1998: 283). Established in 1990, ICLEI was a particularly significant first-generation urban environmental network that focused on the development of accessible accounting tools for municipal use. ICLEI played an important role in the development of early local climate experiments with its broad agenda-setting role, first amongst primarily North American and Western European cities and then across its rapidly growing and diversifying membership by the early 2000s. While ICLEI's initial focus was on local capacity building, there was still an international relevance to this work: advancing local technical capacity in quantifying emissions was seen as the means to casting the local level as an important site to address global issues in the early years of an emerging international climate agenda (Betsill and Bulkeley, 2003; Toly, 2008).

Yet where urban accounting was situated within an expanding field of carbon accounting was not entirely clear. This is made more confusing today by the complex landscape of accounting practices that have continued to evolve since climate change first became a matter of international concern. Stechemesser and Guenther (2012) include within the field of carbon accounting a range of different practices that involve the measurement, collation, assessment, and communication of greenhouse gas emissions (GHG) and sinks, as well as the monetary valuation of emissions. Bowen and Wittneben (2011) identify three dominant types: scientific organizations capturing the

physical existence of GHG emissions; traditional accounting actors managing emissions within an organization or firm for regulatory and/or voluntary purposes; and a larger array of actors (policymakers, industry association, corporations, non-governmental organizations, etc.) that focus on the public disclosure of emissions that are the product of relevant infrastructures, technologies, and/or activities, which become the basis for targeting future reductions and tracking progress. All forms of carbon accounting maintain a philosophical basis in the scientific account of physical carbon in the atmosphere, despite these non-physical surveys reflecting different epistemic worlds that must relate social processes with physical carbon flows (Ascui and Lovell, 2011). An evolving and increasingly complex landscape of financial, political, market-enabling, and disclosure-based accounting means that unclear boundaries often separate these worlds.

Urban carbon accounting has mostly existed at the margins of popular interest until recently. While important to municipalities and urban policy organizations since the early 90s, there was little relevance outside of these narrower groups for more than the decade that followed. Two other domains of "attributional" carbon accounting—accounting that seeks to attribute existing emissions to infrastructures, technologies, and activities, often represented in the form of a carbon inventory—have been of more popular concern. The first is national-level inventories submitted by National Parties to the United Nations Framework Convention on Climate Change (UNFCCC). These top-down, economy-wide emissions inventories are relatively straightforward territorial representations of national scale emissions that typically use existing national production-based economic data as a basis to calculate sector-based emissions tallies. They have become the basis for international agreements and are central to how climate change as a global phenomenon is made governable as a territorial issue matching the sovereignty of the nation-state (Lövbrand and Stripple, 2011).

The second is corporate accounting standards. In the 1990s, an existing tradition of corporate environmental disclosure with roots in the field of social accounting converged with core financial accounting concerns emphasizing corporate risk and risk management (Bebbington and Larrinaga, 2014; Gray, 2002). Breaking with a tradition in sustainability disclosures that were more qualitative in character, increasingly investors, policymakers, and the public identified a need to quantitatively assess corporate emissions, not least to understand new regulatory and competitive risks (Kolk et al., 2008). The establishment of the Greenhouse Gas Protocol (GHGP) in 2001 quickly became the accepted standard, used as the basis for disclosing corporate emissions through the Carbon Disclosure Project (CDP). A major contribution of the GHGP was its establishment of the Scopes Framework now used widely in corporate accounting. The Scopes Framework was devised as a method to deal with the complex boundary challenges faced in corporate inventorying. Where Scope 1 and 2 emissions reflect emissions directly managed by corporations, Scope 3 emissions reflect "value chain" emissions that were attributable upstream to corporate production and activities (Walenta, 2018).

While national inventorying as the basis for international agreements, and corporate accounting as a form of sustainability and risk disclosure, were both widely recognized as important to the emerging international climate regime as part of the Kyoto Protocol, the same importance was not afforded to urban accounting outside of a narrower set of stakeholders. ICLEI continued to publish protocols based on its straightforward activity-based accounting method. The network established its goal as developing methodologies to aid local governments in identifying opportunities and strategies to reduce emissions in pragmatic and easily replicable ways (Kates et al., 1998). "Activities" are processes that local governments can manage for emissions reductions regardless of where the emissions occur. While this simple method encouraged wider local government uptake, the growing number of municipalities that were conducting and reporting local inventories did not by itself lead to an increase in the quantity of emissions being reduced through local action, putting into question the ICLEI process.

Simultaneously, some municipalities were becoming increasingly dissatisfied with these tools as far less comprehensive and rigorous compared to the GHGP for corporate accounting. Cities like Seattle and Boulder were beginning their own experiments to apply the GHGP Scopes Framework to their urban inventory practices as a way to produce more sophisticated local accounts (Boston, 2007). At the same time, the release of new, competing urban accounting protocols by organizations like the World Bank and UN-Habitat were leading to a more fragmented landscape that led to inconsistent and incomparable local inventories.

In this context, rising interest in standardizing methods was being shaped by at least two distinct goals. The first was to bring cities and local governments more explicitly into a decentralizing climate regime where a new orchestrative model of international climate politics was beginning to form following the multilateral failures of the Copenhagen Conference of Parties (COP) in 2009. This orchestrative model relies on the diffusion of norms, standards, and practices shaping international agreements, with one important mechanism of diffusion being protocols of accounting and reporting (Bäckstrand et al., 2017; Lin, 2018). Cities were now being seen as more autonomous agents that could contribute meaningful reductions, but the accountability of cities to a global audience rested on the tracking, aggregating, and comparing of emissions inventories, targets, and progress (Gordon, 2020). A lack of consistency and comparability *between* cities and *as part of* national inventories became a significant barrier to strengthening the authority and relevance of local climate action to national governments, international institutions, and private finance. Co-ordinating methods of accounting would build confidence amongst external audiences that "city climate action is yielding real, measurable, and comparable results" (Compact of Mayors, 2015: 3).

A second important motivation, increasingly dominant since the 2015 Paris Agreement and the increasingly widespread adoption of "net zero by 2050" (NZ50) targets, is the presumption that carbon accounting offers a framework to bring scientific expertise down from the international level and become the basis for implementing science-based policy. This has become an important rallying cry amongst second-era urban policy networks like the C40 and GCoM. Both these networks have been directly influenced by the data-driven, pro-business mandate of Bloomberg as former C40 Chair and current GCoM Co-Chair.

By ensuring consistency and comparability, policy based on carbon measurement can stake a much easier claim to expertise. Policies and plans that are projected to reach global goals (like NZ50) within the local territory are thus framed as part of the scientific management of urban systems and given political leverage in often contested local environments. Yet the assumption that standard frameworks of accounting are measurement infrastructures capable of applying scientific logic to policy ultimately misunderstands how these political forms of carbon accounting represent different epistemic worlds compared to the physical (scientific) study of carbon that remains their philosophical basis (Ascui and Lovell, 2011). Urban carbon accounting—similar to national accounting and other financial and disclosure-based types—are more complex frameworks that by their nature must move beyond scientific accounts to attribute carbon's relationships to social processes, institutions, and infrastructures. Linking natural phenomena to social worlds involves many other complex mediations. Inevitably protocols must internalize epistemic assumptions and material exclusions, following established rules for consistency that make accounts meaningful to specific purposes and more legible as managed knowledge products. This means no single method of accounting can reflect an "objective" scientific lens, but rather one amongst many interpretive frameworks.

The GPC is the culmination of converging interests amongst policy networks, international institutions, and municipalities that sought consolidation of a fragmented landscape of emerging protocols. While adopting many rules from national inventory standards, the similarity of the boundary challenges faced by private corporations and local governments led to the translation of the GHGP's

Corporate Scopes Framework to urban inventorying. This Corporate Scopes Framework represented a more sophisticated method compared to ICLEI's then-popular activity-based method, reflecting a shift in expectations in the role and importance of urban carbon inventories. Earlier methods had focused on expanding uptake across municipalities, where the most significant sources of local emissions could be rapidly quantified as a basis for targeting effective emission reductions through local policy (Kates et al., 1998). Newer methods were far more concerned with rigor and comprehensiveness, and the expectation that local governments should be expected to hold the technical capacity and resources necessary to produce these more sophisticated accounts.

As part of this turn, more precise accuracy was now expected in how urban emissions were located spatially in and around the territorial boundary using the GPC's Scopes Framework. This involved a more precise allocation of emissions to targeted urban infrastructures and activities. Before the GPC's development, already newer urban protocols had begun to experiment with applying the Scoping method, thus the GPC is not necessarily significant for its methodological contributions. However, the GPC has considerable importance for how it has helped to reorganize the field of transnational climate governance around this territorially defined and standardized accounting framework (Wilmsen and Gesing, 2016). With its development supported by a range of international stakeholders, it has rapidly become the most widely accepted protocol whose local uptake has become a membership requirement for admittance into major international programs like GCoM.

Carbon accounting as a spatial practice

This article offers a critical analysis of the GPC accounting standard as a spatial project. The spatial nature of carbon accounting is already a widely discussed topic of carbon accounting scholarship, both within and outside of urban areas. I first examine this literature before turning to the GPC. I highlight in this section two important spatial processes: the role of accounting in locating and fixing carbon in territorial space; and mobility of carbon (and deterritorialization of space) through accounting-based commensuration.

As the basis of collective international agreements, the establishment of national inventorying systems as part of the UNFCCC infrastructure was central to making climate processes manageable through national space (Lövbrand and Stripple, 2011). Despite making little sense to a globally defined carbon cycle science in the 1990s, this territorial projection of carbon was critical to establishing a multilateral system of climate governance, where "stocks and flows of carbon" were transformed into objects of governance that could be embedded in state territory and thus managed through state-based institutions (ibid: 188). This reflects a much longer history of defining nature in relation to existing territories of state power, where the territorial framing of nature has long been foundational to establishing the authority of the modern state (Whitehead et al., 2007). The use of statistical surveys and quantified data has been key to this defining of state-organized natures. Carbon, argues Rice, appears to match this "territorial logic of the state, precisely because it is measurable and quantifiable" (Rice, 2010: 935).

Nothing intrinsic to the national scale makes it more relevant as a state space within which to territorialize and manage carbon. Just as at the national level, territories of local climate governance can also be defined through carbon accounting work (Rutland and Aylett, 2008). Not only serving to territorialize carbon, the urban inventory also serves to attribute carbon to infrastructures and activities that are familiar and recognizable to local government, like public transportation policy or the operation of municipal waste facilities. Carbon accounting is thus a means of reproducing jurisdictional authority, ultimately "carbonizing" local governance itself (Rice, 2014). The everyday actions of citizens also come to be made relevant to climate change through carbon's

calculability, where carbon's power can be enacted not only over but also *within* the urban landscape as it "plays a central role in defining targets of urban planning and molding of urban environmental citizenship" (Rice, 2014: 385). Compared to earlier and more diffuse sustainability agendas, carbon management enables a stricter form of socio-environmental governance where a low-carbon urban polity can be focused around a harder-edged set of goals defined within territorial limits (While et al., 2010).

Not only does carbon accounting play an important role in its *fixing* of carbon in space where local actors claim responsibility over carbon through territorial work. The common calculability of carbon is also central to the deterritorialization of urban environments: necessary to globalize power over and interests in local urban development through the lens of carbon emissions.

Scholarship on the commensurating work of carbon accounting offers a foundation to explore how the mobilization of urban environments within new international networks is also central to how the GPC reproduces power and authority as part of a new global governance project. Carbon accounting enables the comparison of spaces, infrastructures, and activities across geographies as it is based around the abstract and common metric of CO2 (Espeland and Stevens, 1998). By enabling and strengthening processes of commensuration, both consistency and comparability of inventories become instrumental to the collapsing of geographic space (Gupta et al., 2012). Literatures on carbon marketization have explored in depth how carbon is now geographically mobilized through new networks of exchange that are built from a set of standard rules and protocols for the accounting of carbon and thus the locating of carbon in space. As a calculable entity, carbon has helped produce new relational geographies through its enrollment in market processes where technical devices of accounting provide an organized framework for collaborative and cross-territorial forms of action (Callon, 2009; Clark et al., 2009). According to Methmann, calculative practices used to establish carbon markets are the means of creating new fields of visibility "connecting decentralized and distinct locales within the globalized space of carbon governmentality" (Methmann, 2013: 79). This relies on not only making new carbon objects visible to global market actors but also on establishing the appropriate conditions for temporal and spatial exchangeability.

Since reductions can now be assumed to have the same global effect no matter where they are realized, market frameworks have encouraged the pursuit of reductions in spaces where they can be more cheaply produced (Green 2011). This often has meant a focus on projects in the Global South, where claims to space by global actors—commonly peasant and indigenous landscapes—can be made legitimately as part of a global rationale to reduce emissions (Boyd 2009; Bumpus and Liverman 2011).

Lessons from this literature on how the exchangeability of carbon fosters new claims over space and its democratic effects are also relevant when considering the spatial implications of an international urban standard like the GPC. Over the last half-century, local governments' use of packaged investment instruments to fund many of their local infrastructure needs already illustrates how global and local space have been connected through financialized networks that shape the deterritorialization of embedded urban assets (Weber, 2010). The GPC was created with an explicit intent to make carbon accounting consistent and comparable across geographies and amongst scales and thus offers such a connective framework. Focusing on how urban projects could be made more directly relevant to national governments and private finance was an explicit goal driving the GPC's development that speaks to how it was imagined as a framework to connect global with local interests, often for the underlying purpose of attracting finance (see below). Thus carbon has become a new metric of value motivating new interests over the control and management of urban space.

While much of the GPC's method draws from other existing protocols for urban and other spaces of action, it extends the existing spatial work of accounting standards in a couple of key ways that I expand on below.

First, the GPC establishes its field of vision explicitly around the locatability of carbon in and around the local jurisdictional territory, which I argue is critical to making local accounting relevant and legitimate to national, international, and private finance interests. Second, in offering this common means of locating carbon in space, the GPC as an international standard also establishes the conditions for carbon to be recognized in value, and exchangeable in either market or other policy-relevant processes, between spaces and scales. This allows for urban environments to be remade as strategic spaces to channel carbon-reducing projects deployed by a wider array of global actors.

Locating carbon in space: the GPC as a territorializing instrument

As explored above, urban inventories, like national inventories, have always been instruments to locate carbon in territorial space such that it becomes a locally governable object. The GPC extends this existing territorializing work, where a stricter imposition of the territorial boundary is the foundation for establishing its Scopes-based accounting.

Like the GHGP, the GPC identifies three clear Scopes to organize and locate carbon in space. Yet in place of a corporate organizational boundary, the GPC's Scopes Framework instead takes the territorial boundary of the local jurisdiction to organize and hierarchize emissions into three buckets: those occurring physically within the territory (Scope 1), cross-boundary emissions occurring as a consequence of grid-supplied energy that is consumed within the territory (Scope 2), and emissions occurring outside the territory but induced by activity within the territory (Scope 3) (see Figure 1). Even while emissions that occur outside of the territory are made meaningful in Scope 2

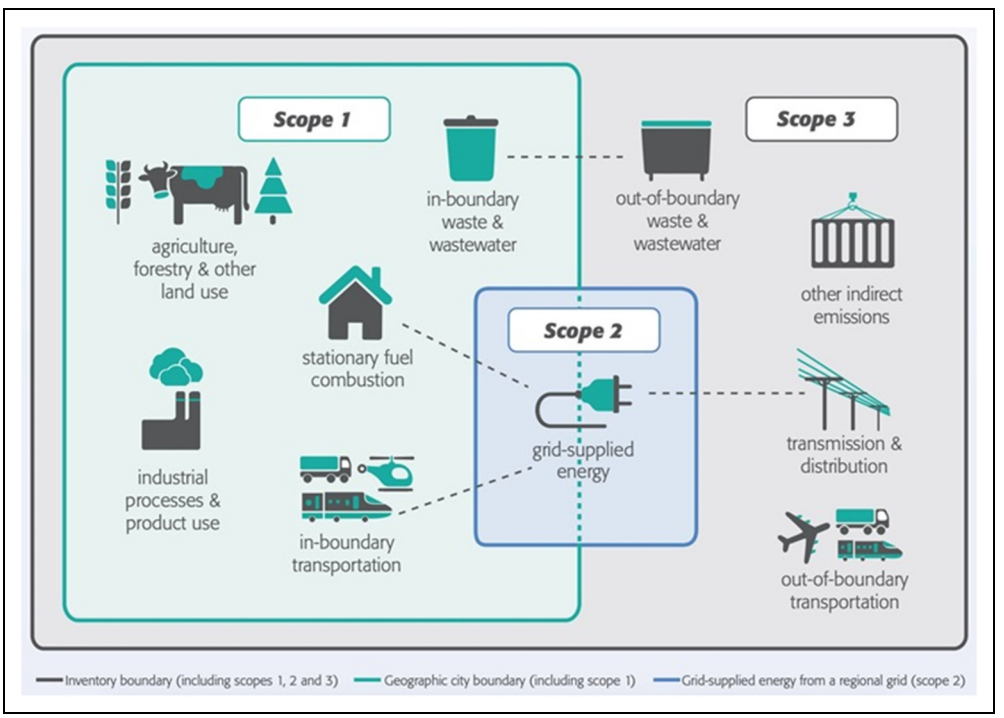

Figure 1. Emissions sources and scope boundaries of GHG emissions defined by the GPC framework. Source: World Resources Institute, C40, and ICLEI, 2014.

and 3 accounting, the relevance of these emissions is still based around a territorial first principle. The process of inventorying these emissions in urban accounts and attributing them to the space of the city is a practice of relocating emissions from their real geographical locations *into* the urban territory, as cities take ownership over them through the inventorying process (Rice, 2010).

The GPC's Scoping method creates a consistent framework from which several different inventory approaches can be used. This reflects the fact that different types of inventories can be compiled using the GPC to serve distinct *purposes*. Additionally, different levels of reporting are included in the GPC protocol that enables distinct levels of inventory *comprehensiveness*.

The option to compile a "pure territorial" or a "city-induced" inventory reflects a distinction in purpose or the intended use of the inventory. It is usually expected that local governments will report both types. A city-induced inventory is seen as reflecting more accurately the emissions resulting from urban energy consumption. This need to incorporate emissions that occur outside the territory—but which are induced by activity taking place within the territory—has long been recognized as central to capturing a more accurate reflection of a city's emissions (Torrie, 1993). This is especially the case with electricity, a major component of many local level emissions where regional power plants often exist outside the territory. The same challenge is frequently acknowledged of methane from urban waste where emissions occur in landfills and processing facilities that may be very distantly sited.

Yet despite representing an important proportion of local emissions, the inclusion of extra-territorial emissions poses a challenge when aggregating emissions inventories between territories in an urban region, nation, or at the international level. Thus, as the GPC states, the pure territorial method is also required in city reporting as it "allows for the aggregation of multiple city inventories while avoiding double counting" (WRI et al., 2014: 20). Whereas the city-induced inventory is the framework around which cities are compared and evaluated internationally, then, the territorial inventory is a geographically discrete compilation of emissions that can be used for aggregation across multiple scales.

In addition to codifying two different approaches to inventorying based on these unique purposes, the Scoping method is also a framework to enable different levels of emissions *comprehensiveness*. This is encapsulated by the BASIC and BASIC+ levels of reporting for city-induced inventories. A BASIC level inventory includes all Scope 1 and 2 emissions. It also includes waste-generated emissions (Scope 3) because of its significant contribution to urban emissions. This is meant to ensure major buckets of emissions resulting from local activity are accounted for and represents the expected minimum according to GPC guidelines. BASIC+ is a more complex reporting level including many other out-of-boundary emissions associated with stationary energy, transportation, energy, and waste. It is also the only reporting level to incorporate two IPCC-defined economic sectors: Industrial Processes and Product Use (IPPU) and Agriculture, Forestry, and Land Use (AFOLU). In addition, this level can include transboundary transportation and energy transmission and distribution losses. Where these sources of emissions are significant, cities should "aim to report according to BASIC+" (WRI et al., 2014: 36). Yet as the GPC protocol also makes clear, the BASIC+ reporting level "reflects more challenging data collection and calculation processes" (WRI et al., 2014: 35). Thus, this more comprehensive reporting level may be administratively or fiscally infeasible for many local governments.

Calculative practices like carbon accounting ultimately serve to "render visible some things and invisible others" (Paterson and Stripple, 2010). Drawing on the importance of how and where carbon is made visible, Walenta (2018) argues that, amongst corporate entities, the GHGP's Corporate Scopes Framework has become a means of enclosing climate responsibility in particular places and erasing responsibility in others. Where many corporations leave unaccounted Scope 3 (value chain) emissions in public reporting, Scope 1 and 2 under direct corporate control are reported and thus seemingly made more meaningful to climate politics at large. This has led to an uneven geographical survey of emissions related to corporate activity that misrepresents how corporations have responded to climate change, which has led to gross misunderstandings of

corporate progress in addressing emissions. While corporate reporting shows a marginal decrease in Scope 1 and 2 emissions over time, it is Scope 3 emissions that have continued to rise, and yet often remain unlocatable relative to corporate activity. Scoping is thus used as a practice that helps legitimate where companies are "responsible for climate change and where they are permitted to neglect it" (Walenta, 2018: 476).

In contrast to the much larger Scope 3 emissions existing outside corporate organizational boundaries, GPC-based Scope 3 emissions occurring outside the local territory are typically more modest compared to Scope 1 and 2 urban emissions. Still, including Scope 3 emissions can upend assumptions on how urban economic development is related to carbon emissions: while the relationship between economic growth and energy-related emissions is often considered to follow an environmental Kuznets curve (the inverted U), this is no longer the case when including the outsourcing of environmental impacts to the regional hinterlands (Wiedmann et al., 2021). While a growing number of local governments are beginning to report a BASIC+ Inventory including Scope 3 emissions, these accounts are often partial and incomplete, reflecting the complexity of this level of comprehensive surveying (Chen et al., 2019). For many cities, what is ultimately reported falls below the expectations for an ordered, comprehensive account of global urban emissions. Outside of well-resourced cities in the Global North, information about data assumptions, input data, data sources, emission factors, and calculation methods is often not appropriately disclosed, making the quantitative insights more ambiguous (Baltar de Souza Leão et al., 2020; Kongboon et al., 2022).

The GPC is a sector-based inventory method that mirrors production-based national inventorying with the aim to locate emissions where they physically occur. Recognition that other inventory types might be useful to supplement our urban emissions knowledge has led recently to explorations on the potential of urban consumption-based accounting. Amongst consumption-based footprints calculated by a small number of cities, the use of input–output methods based on national economic data is the most popular method, as the physical data is far more difficult to compile given its location in often distant geographic spaces (Heinonen et al., 2020). These inventories are often seen as less directly relevant in a policy sense, where it is more challenging for data to directly inform policy or be used as evidence of successful policy outcomes. Despite their more modest usage, it is well recognized that cities in the Global North tend to have much higher consumption-based inventories, up to four times as high as sector-based inventories in Scandinavian cities, places often seen as global urban climate leaders (Broekhoff et al., 2019).

Rather than suggest one inventory is more correct or explanatory than another, different approaches to emissions accounting more accurately demonstrate different forms of relevance, each offering some use in devising more effective transitions of emissions-intensive urban economies. Nevertheless, the continued dominance of the GPC as a sector-based inventory continues to base our global, comparative knowledge around local climate action within a territorially delimited lens. The different perspectives offered by a sector-based versus consumption-based method are relatively clear. Yet what remains far less visible is the dynamics of urban systems that contribute to climate which can't be measured reliably in carbon terms. An exclusive understanding of how urban processes are related to climate change through the framework of carbon is further entrenched as urban policy relevance and evaluation are established by powerful international interests based on city-reported data to global reporting platforms.

Mobilizing emissions and rescaling climate politics through the GPC framework

Locating carbon in territorial space is the precursor to making the urban management of carbon possible; but doing so in a comparable and consistent manner is the precursor to making urban-based

carbon internationally relevant, opening urban space to new international interests and flows of finance. Early agreements amongst urban policy networks and organizations recognized that a coordinated standard was key to making climate finance more accessible to cities. As a "robust, transparent, and globally accepted framework to consistently identify, calculate and report on city greenhouse gases," the GPC offers cities and local governments a tool to not only shape local targets and action plans but "strengthen opportunities for cities to partner with other levels of government and increase access to local and international financing" (WRI et al., 2014: 7). The growth in urban climate finance and wider interest in urban development projects reflects a belief that urban environments may be more logical settings within which to manage and achieve global carbon targets. Whereas multilateral governance is often hampered by complex political roadblocks at the international level, the local political arena is frequently seen as a more tractable political space to implement global policy agendas. This is encapsulated by a popular adage within the C40 network: "While nations talk, cities act."

The local scale is thus often offered optimistically as a space in which more direct action is possible. Simultaneously, it is often assumed to be a more democratic scale where public participation is more likely to shape policy. Yet the intuition that the local scale is intrinsically more democratic is based on assumptions that political proximity between constituents and policymakers leads to a more open and democratic process (Purcell 2006). Yet the outsized influence of financial interests over local policy decisions has been a major concern since many institutional reforms of the late 20th century (Peck et al., 2009). As new carbon measurement frameworks are imagined as infrastructures through which policy can be devised and implemented—supported by consensus that adherence to such accounting work enables local access to much-needed circulating resources—similar questions must be asked as to how the local scale is made a strategic space through which interests and projects outside this scale become channeled through local carbon-reducing projects.

For scholars of transnational climate change governance, the more orchestrative design of the Paris Agreement is often understood to be the means of sidestepping many of the difficult distributional conflicts over carbon that have become inherent to post-Kyoto multilateral negotiations (Falkner, 2016). Both nonstate and substate activities are imagined as important complements to and part of the means of implementing the Paris Agreement's Nationally Determined Contributions (Chan et al., 2015; Hale, 2016). The shift toward other actors and spaces and the emphasis on monitoring and reporting is also, however, characteristic of a shift toward more complex governance systems that are also implicated with neoliberal policy agendas, including an ideological shift toward markets and a shift in rationalities and modes of governance that rely on information sharing, peer pressure, monitoring, and certification (Andonova et al., 2009; Bulkeley et al., 2014; Power, 1997). Yet while this scholarship draws important attention to how norms are diffused through accounting standards and informally regulated through mandated reporting practices, left unclear is how relations amongst and between scales and spaces of climate governance come to be reconfigured through a new framework of measurement.

In considering the spatial work of the GPC as a standard, then, I argue for more attention to how it is involved in the reworking of scalar relationships. While scale is often used in urban climate scholarship to make sense of the relevance of local action to global goals, rarely has this been shaped by a more dynamic and relational approach to scalar construction (Bouzarovski and Haarstad, 2019; Bridge, 2018). As a transnational governance project, the material and representational work of carbon accounting as a framework to establish transformed scalar relationships is critical to how power and authority in the emerging urban carbon governance regime are articulated. I focus on two themes of scalar restructuring below: the globalization of the local territory and the remaking of the local scale relative to other environmental and political scales of climate.

Globalizing the local territory: enabling competition and aggregation

New economic indicators were key to the establishment of city-to-city comparisons and urban competition as part of a globalizing 20th-century economy (Harvey, 1989; McCann, 2004). Similarly, the GPC provides a framework for new climate-centered indicators to shape competition between cities. Early forms of urban economic competition had already led to the emergence of "sustainable city" branding exercises, which have also been associated with efforts to attract footloose global finance and creative economy workers (Garcia-Lamarca et al., 2021; Hollands, 2008; While et al., 2004). More quantitative forms of sustainability benchmarking that are based on audits, rankings, indicators, indexes, baselines, or targets are now becoming standard, most of all in the domain of climate change governance (Broome and Quirk, 2015; Kornberger and Carter, 2010).

As a framework of calculation, the GPC attempts to settle the domain upon which cities are able to compete with one another and demonstrate climate leadership. More than a tool to spatialize local ownership over emissions—codifying the relevant boundaries, temporalities, and emissions that become reportable through a common metric—the GPC offers a measurable basis on which to make claims to climate leadership (and point out laggards) by circulating representations of these territorial emissions (see Figure 2). Producing relevant carbon data that will allow the urban territory to circulate through global campaigns means that, for those cities that do not have the requisite resources, they are not offered the opportunity to enter the field of comparison and evaluation. As Creutzig et al. highlight, it is often the richest cities most dedicated to climate change that can compile the best data, which has broader implications in global knowledge as it results in a "huge bias in the data representation of cities" (Creutzig et al., 2016: 2).

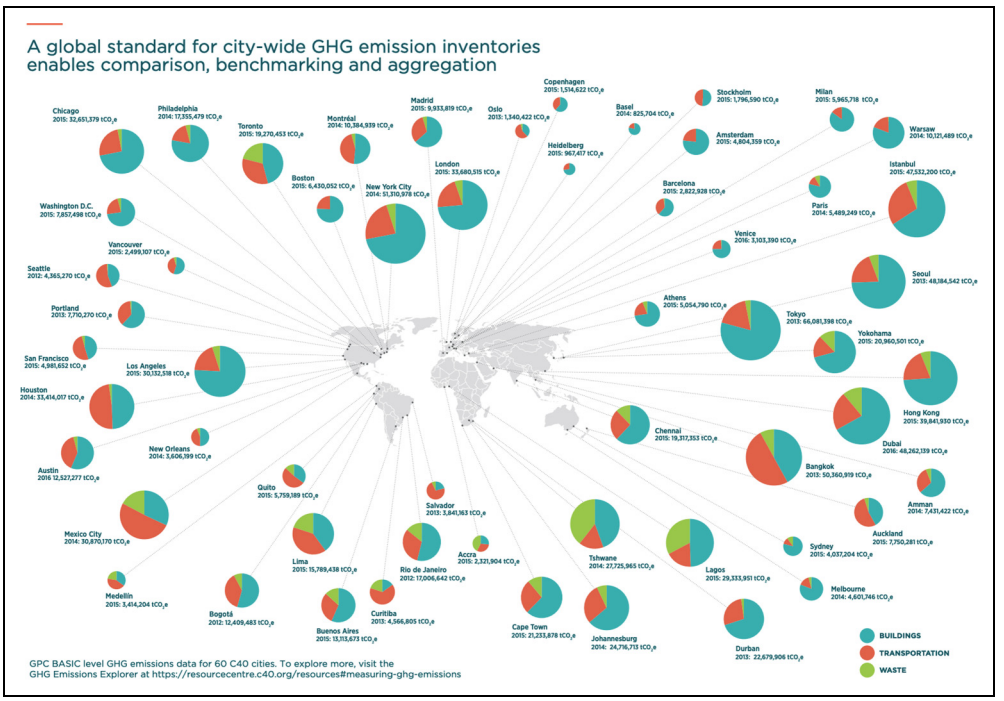

Figure 2. According to the C40, an important benefit of a global emission inventory standard is the opportunity for comparison, benchmarking, and aggregation. Source: C40, 2018.

These new global representations of territorial emissions are not only relevant for how they attract notoriety and resources through comparison and competition. It is also the opportunity to *add up* territorial accounts of carbon that is significant. This aggregation of territorial inventories supports the political goals of many urban networks and policy organizations that seek to bolster the legitimacy of the urban scale within an international climate regime. The ability to aggregate urban accounts offers the quantitative basis on which to express the immense proportion of global emissions that can be attributed to "urban" territories. Aggregation of territorial emissions is thus a powerful rhetorical device to leverage the importance of city climate action in realizing global goals.

This extends in many was the popular urban age thesis that pervades international urban policy discourse, bolstered by the recent New Urban Agenda movement that is similarly built atop a faith in urban expertise to solve global problems, the basis of which is often quantitative data (Caprotti et al., 2017; UN Environment Programme, 2017). The original logic of the urban age thesis is simple: since over 50% of the global population live in cities, global issues must be intimately connected to and commanded by city action. This makes cities apparently privileged spaces where global challenges can be solved. Yet essentializing the territory of the city fragments how global socio-ecological problems are the product of complex material processes connecting the city with expansive landscapes that often exist outside the urban policy lens (Brenner and Schmid, 2014). This is also an important effect of the territorial emissions inventory as a representational object: in establishing its dominance as a way of representing the relationship between local action and global climate goals, the complexity of urban material processes that are the basis for global environmental change are left increasingly illegible as a territorialized, aggregative understanding of how urban action *adds up* to global significance is given political authority.

The importance of cities to solving global problems based on a territorial representation of urban potential has perhaps been no more celebrated than by urban environmental policy advocates. For instance, ICLEI's promotion in the early 1990s on urban environmental action was initially premised on the need for city-based climate action based on the soon-to-be-reached "50 percent of global population living in cities" threshold (UNEP, 1990: 6). This rhetorical argument that bases the relevance of city-based action to the urban proportion of the global population has since been extended to an argument based on the urban proportion of global emissions. GCoM's Global Aggregation Report uses emissions data to make these sorts of rhetorical claims: whereas just over 50% of the global population lives in cities today, this will grow to 66% by 2050. Over 780 million urban residents were represented by GCoM's 9149 members in 2018, meaning strategic action amongst members could lead to a possible avoidance of 1.4 billion tCO2e by 2030 and 2.8 billion by 2050 (GCoM, 2018). Similarly, the C40 has based its potential to contribute to global target goals by underscoring how the vast population of their megacity members reflects a vast proportion of potential global emission reductions, presenting members' emissions as a slice of the global emissions pie (C40 and Arup, 2016). Locating population within the city territory as a way of bolstering the relevancy of city-based action is now paralleled by, and intimately related to, a similar location of carbon in city territory.

This emphasis on the location of emissions within urban territorial space is reflected in the importance of territorial boundaries in the GPC framework. Unlike techniques to produce top-down accounts of national emissions inventories, the GPC becomes a means of measuring territorial emissions from the bottom-up by compiling new forms of physical data that are valuable resources for national and global action as they extend beyond the more spatially imprecise national emissions data that uses national economic statistics as its basis. The precision that the GPC's compilation of physical data entails is imagined as an opportunity to build more comprehensive geographical knowledge of where emissions occur, particularly as territorial accounts of carbon data

are compared or aggregated. Yet the fundamental belief that geographical location of emissions is the most critical factor to how urban systems are relevant or meaningful to global climate is itself an assumption that is far from self-evident.

The urban territory as a nested climate scale and new climate "object"

The re-scaling of climate action politics from the international to local level is often seen as one important effect of a decentralized climate regime. Yet the transnational governance literatures that focus on the diffusion of international norms and principles through measurement and reporting standards don't often engage with a more dynamic, relational understanding of scalar construction. I argue this perspective is critical to make sense of how claims to power and authority over urban environments are made possible as part of this decentralizing project.

Classic literatures on scale focused primarily on how scales are produced, why certain social phenomena tended to be articulated at certain scales and examined the evolving relations amongst and between scales (Brenner, 2001; Marston, 2000; Moore, 2008; Smith, 2000). McCarthy critiqued this initial theorization for mostly excluding the role of environment in scaling processes, arguing that this overlooked how the "contested production of socionatures is inseparable from the contested production of scaled sociospatialities" (McCarthy, 2005: 200). Rather than simply assume that the rescaling of environmental governance occurs in response to an attempt to match a set of preexisting and self-evident environmental systems (like forest boundaries, watersheds, etc), the production of new environmental scales is an important process that often shapes how environmental systems come to be governed, and how power and authority over those systems are produced.

The global climate is one important illustration. While often taken to represent a natural environmental object, Cohen and McCarthy (2015) suggest the global climate should be seen as a constructed object of governance: the product of representational work that helped to enable the legitimacy of the international climate regime. This has involved the establishment of carbon dioxide as a figure aligned with the maintenance of a *stable climate* at the *global scale* manageable through institutions of *global environmental governance*. Carbon's calculability played a key role, as it is treated as a commensurable and easily understood unit that can be regularly reported and the key variable in scientific scenarios of future warming. This focus on carbon was "in part a result of efforts to rescale governance to the 'global' scale in the context of climate change" (Cohen and McCarthy, 2015: 12).

The GPC elevates urban action by establishing a system of measurement that is consistent with national accounting standards, such that local action can more easily be framed as a contribution to goals established at national and international levels. This shift toward the urban level is thus in part an extension of an existing state territorial logic wherein the locatability of carbon within state territories becomes a fundamental precursor to establishing responsibility over carbon within the context of a collective international response (Lövbrand and Stripple, 2011). According to the C40, complying with national inventorying guidelines is part of how the GPC "allows for credible comparison and aggregation across timescales and geographies" (C40, 2018). The local level inventory, then, becomes a disaggregated piece of the national inventory within which it remains encompassed, supporting a multi-level governance framework that situates the local as subsidiary to higher levels and projects of climate action above.

Yet at the same time this traditional state-territorial logic is extended, the GPC also offers a framework to disentangle urban environments from their national settings. The local scale becomes a space *through which* global climate processes are made governable. Nowhere is this clearer than in the new discourse of the local carbon budget that is based on the GPC inventory.

This new idea of a local carbon budget suggests that the scientific concept of the global carbon budget, related to global modeled projections of surface temperature rises, can be remade into a governance tool shaping the scientific management of new local climate systems. The logic of the global carbon budget reflects the scientific principle that what matters to climate change is the accumulation of carbon over time in the atmosphere, not the total amount of emissions produced in a year. Thus, in thinking about how we must set our ambitions in addressing climate change, it makes more scientific sense to consider how much carbon is left to be emitted before we overshoot a given temperature scenario, like 1.5°C.

Under the C40 and GCoM's guidance for city climate action plans to be made "Paris Compliant," a 1.5°C temperature target is projected onto the local territory. According to the C40, the carbon budget is thus a tool for establishing science-based targets where reductions achieved in the local climate system can be quantitatively described as having achieved (or not achieved) a 1.5°C global temperature rise (C40 and Arup, 2016). The GPC is typically adopted as the measurement framework through which a local budget is established, and this is now a requirement of C40 membership. As C40 Executive Director Mark Watts describes: "Establishing 1.5°C as C40's boundary for rising temperature and, therefore, carbon budget was a pivotal moment in C40's development. It decisively established science as determining our key goals" (Watts, 2022: 7).

The local carbon budget only becomes a legitimate policy tool when it is backed by scientific authority. A standard and consistent framework to account for carbon is needed for the local carbon budget to be granted scientific legitimacy, where the measurement of carbon locally is imagined as consistent with global scientific measurement. A local climate comes to be defined using terminology drawn from global climate science—including the carbon budget, but also related terms like "temperature overshoots" which can now be used to describe ineffective local policy that misses a 1.5°C trajectory—the local territory itself becomes a scaled climate object around which local policies and projects are given scientific authority and meaning. The local scale in this context becomes a space in which global climate goals can be performed, and urban environments are framed as spaces through which global climate can be scientifically managed.

Two scalar representations of local climate are thus produced through the accounting framework afforded by the GPC. First, the local climate becomes a nested scale within an existing state-centered hierarchy of global carbon regulation. The local level is then imagined as a building block within an international system that describes the uncomplicated accumulation of emissions as one moves upward in scale. Second, there is a more direct association with the local territory as a reflection of the global climate and structured as a more autonomous system. This creates a new object of governance—the local climate—that can be detached from its nested political and material context. Drawing down scientific terminology like carbon budgets or temperature overshoots, the new local climate as a socio-natural scale seems capable of being detached from climate politics in other scales and spaces. Both projects rely on a standard framework to assign carbon within local territory for their legitimacy. Whether as an instrumentalized political space to help realize national and international goals or as an environmental scale that can be scientifically managed to reach global targets, new claims to authority over urban environments are increasingly rationalized on this basis of carbon.

Conclusion

This article has analyzed the GPC as a spatial project. Fundamentally, the GPC is an instrument to locate emissions within local territorial space. Locating emissions in space is part of how local claims to regulate emissions are made legitimate, something that also characterized urban emissions inventorying before the GPC was created (Rice, 2010). The GPC extends this focus by taking the

territorial boundary as a more critical organizing principle for allocating emissions in space through the Scoping method, thereby giving this spatialization of carbon international relevance and legitimacy.

This fixing of carbon in space is also a precursor to the deterritorialization of urban environments via much wider claims to carbon, where new power over urban environments can be channeled through claims to emission reductions. While concerns that global systems of accounting, reporting, and benchmarking serve to instrumentalize local action are widely shared (Broome and Quirk, 2015; Dryzek, 2013; Hughes et al., 2020), this article contributes by examining the relevant processes through which new relations between local action and national or global goals are spatially produced as part of a new data-based urban climate regime. This process involves, on the one hand, globalizing the local territory by appropriating it within new systems of comparison and aggregation that characterize an evolving international climate politics. On the other hand, the local territory itself is transformed: into an instrument to achieve national and global goals and as a bounded environmental system within which global goals can be performed, reflected in the adoption of carbon budgets and NZ50 climate targets that extend scientific descriptions of global carbon cycles.

This article's analysis points to further reflection on what a spatial perspective might add to our understanding of how urban climate action could better support a just climate transition at the global level. First, deeper reflection is needed on whether the territorial basis of emissions accounting offers a useful foundation for devising more effective climate action. Promoted as the dominant framework to make emissions visible and spatialize responsibility over those emissions, the GPC and its Scopes Framework have become the representational basis upon which policy goals are established and pathways to realize those goals are selected. Yet while promoted as a consistent and reliable method to locate emissions in space, the physical location of emissions does not necessarily make legible the underlying processes through which these emissions are produced. Amongst urban policy advocates, urban environments are often discussed as either a strategic "target of an energy transition, as well as a key 'instrument' in delivering it," yet rarely is the notion that an energy transition maybe be more fundamentally about a transformation of *urban processes* considered (Rutherford and Coutard, 2014). This emphasis on urban processes recognizes that relevant material flows and transformations that are at the heart of global climate change are extensive, connecting urban spatial and economic development to both near and distant landscapes.

Scientific representations of global climate change do the important work of proving the physical reality of anthropogenic greenhouse gas emissions as the cause for ecological disruption. This, in turn, has encouraged the seemingly logical focus on emissions as the target of policy. Yet it is not so clear that this focus is the most effective approach to realizing our global environmental goals through political action. While a useful proxy to evaluate the impact of local action on climate progress, carbon emissions compiled through frameworks like the GPC are *neither* the actual object of governance—where urban policies and projects must ultimately effect a transformation of sociotechnical infrastructures and the material flows they enable—nor do they objectively reflect the physical emissions circulating in the global atmosphere. Rather than assume that a rigorous location of emissions in space should be the primary goal, making the systemic causality of emissions more legible could promote alternative and perhaps more effective action. Encouraging a view beyond the local territory clearly puts into question the jurisdictional limitations of local action, an important concern. Finding ways of making local action meaningful beyond the territory is, however, necessary to shape more effective transitions. Thus, I argue that making climate governance "fit" jurisdictional norms is not necessarily the most effective approach. This means alternative representations to describe the ways that urban spaces and processes are relevant to global goals are needed.

Second, a spatial analysis of the GPC as a global standard also points to the importance of considering how emissions accounting is implicated in the reorganization of power and authority over urban environments. An enhanced role for private investment in financing new urban infrastructures for emissions

reductions was particularly significant to the GPC's development. Legible, comparable evidence demonstrating meaningful reductions was seen as a precursor to incentivizing new flows of finance into city spaces globally, from private investors but also higher levels of government. Initially, the Bloomberg approach that is embodied in the GPC was looked upon skeptically by European partners that joined GCoM in 2016. Concerns were that such a tool would be used to forward a highly "commercialized" agenda, where the protocol would establish a "direct link between GHG emissions and funding opportunities" and where financial investors became a "new class of actors that has been written into the GCoM" (Gesing, 2018: 130). Despite this initial skepticism, GPC adoption has rapidly proliferated amongst cities globally. A key intention of the GPC to open urban space to external investment points to the many ways it is implicated in complex renegotiations of power over urban space. The authority of private investment in shaping urban development through the framework of emissions reductions must be closely examined and interrogated, especially as climate mitigation continues its rapid rise as a local governmental priority.

More attention must also be given to the scalar processes at work wherein carbon as a common, calculable entity becomes a framework to: compare urban territories; add them up; transform the territory into an instrument to achieve global goals; and transform the urban environment into a climate system to be managed scientifically. Each of these transformations pose clear challenges to the democratic character of local planning and decision-making. Carbon accounting offers the means to consolidate climate governance norms and principles, organizing these in and around new environmental scales. The rescaling of climate governance, as part of a more orchestrative international regime, sees decentralization as an opportunity to overcome difficult international collective action constraints. A standardized accounting framework appears to give decentralized governance its coherence. Instead of simply viewing this as a process of diffusing international norms and principles, however, a spatial critique draws attention to how new relations of power and authority are actively produced through the reorganization of climate scales.

As a final point, it is important to recognize that emissions accounting continues to offer a valuable knowledge resource that can play a role in helping to make visible certain emissions patterns and help target effective action. Whether the GPC is the most appropriate method amongst others for shaping more effective policy is not clear. Instead of focusing local resources toward more comprehensive, more rigorous accounting work that may or may not actually benefit local political action, encouraging more pluralism in the accounting of emissions is crucial.

This acknowledges, first of all, that many forms of accounting beyond the sector-based territorial inventory are potentially useful to shape action. It also means thinking of how actors outside the policy environment could more directly inform and shape local priorities and planning strategies by engaging in measurement experiments. Thus, rather than simply critique the measurement of carbon as inevitably subservient to global neoliberal policy agendas, emphasizing how community-centered and experimental forms of accounting might help foster a different type of accountability could offer a more productive pathway forward (Haiven, 2016). Carbon may be epistemically limited in its capacity to describe the relations of social processes to global climate change, but it is nevertheless a powerful resource that should be engaged and experimented with beyond these hegemonic calculative projects. Moving away from the abstracting world view of a global carbon accounting model, a focus on finding new ways to contextualize carbon across a range of socio-material environments might still contribute to more effective and just climate transitions.

Highlights

- Efforts to standardize urban carbon accounting reflect shared goals to make urban inventories comparable and consistent in order to elevate international significance.

- Concerns also exist that compliance with standards can shift local accountability toward metrics and instrumentalize local actors and projects.
- Literatures on accounting standards in transnational governance do not yet engage with a spatial perspective that analyzes how power and authority are expressed via measurement frameworks.
- Two key spatial processes are analyzed: the fixing of carbon in territorial space and the mobilization of carbon and deterritorialization of urban environments.
- A dynamic and critical approach to scale reveals how urban territories are globalized and new scalar relations are produced through a common measurement framework.
- The implications of a standardized global urban accounting lens to just and effective global climate transitions are discussed.

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Note

1. The network was originally launched by Bloomberg as the Compact of Mayors in September 2014. The new name was adopted following a merger with the European Covenant of Mayors in 2016.

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