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The role of local governments in international climate policy

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Summary

Local governments play an increasingly important role in international climate policy. Climate action follows existing trajectories of sustainable development action at the local level. The history of climate action in cities suggests a lot of potential for learning from previous sustainability experiences. This article concentrates on three aspects of climate change governance at the local level: the motivations for responding to climate change, the different responses deployed, and the city structures and networks representing cities in the global spheres.

Current interest in climate change action at the local level follows three decades of local sustainability action. Because of engagement with environmental conflicts at the local level, environmental justice activists also influenced local climate action. Cities and settlements are exciting policy arenas with great potential to enable just transitions. However, the impacts of local government's action at both the local level and internationally are not always evident.

Cities have sought to address climate change through planning, harnessing co-benefits of climate action, and finding appropriate evaluation means. Solutions have also been developed through the insertion of cities in global circuits of knowledge production via transnational municipal networks (TMNs).

Local government action can only be explained with reference to the international climate change regime. International policy events influence local government action, and local government action influences international discourses of climate action. A range of actors from local governments to businesses, communities, and civil society also play a role in addressing climate change. Still, they require autonomy and resources to deliver mitigation and adaptation actions that local governments can mediate.

INTRODUCTION

Including cities in climate change governance is now a key pillar of climate policy. The Network of Regional Governments for Sustainability and the Climate Group, for example, argued that:

> "*Subnational governments from all over the world have demonstrated in a number of ways that their contribution and leadership is essential to help achieve the ultimate objectives of the UNFCCC since, according to UNDP, 50% to 80% of adaptation and mitigation actions necessary to tackle climate change are or will be implemented at the subnational or local level of governance*" (nrg4SD and The Climate Group, 2010).

Such inclusion has become more urgent after the adoption of the 2015 Paris Agreement and the realization that National Intended Contributions were not sufficient to keep the increase of the average global temperature under 2 degrees Celsius. The renewed impulse to focus on the more ambitious target of keeping temperature changes under 1.5 degrees Celsius (IPCC, 2018) puts further pressure on all government institutions to contribute to climate-resilient transformations.

Cities and urban areas have gained increasing recognition in international sustainability policy. The 2030 Agenda for Sustainable Development explicitly recognizes the importance of realizing "sustainable cities and communities" through the adoption of a goal for cities (SDG11) (United Nations, 2019). The New Urban Agenda highlights cities' importance to "*reduce vulnerability, build resilience and responsiveness to natural and human-made hazards and foster mitigation of and adaptation to climate change*" (United Nations, 2016 p.19).

Likewise, the Paris Agreement acknowledges the role of "*cities and subnational authorities*" in realizing emission reductions and in terms of their vulnerability to climate change impacts (UNFCCC, 2015). The 5th IPCC Assessment Report included an urban chapter for the first time. This report pointed to vulnerabilities of urban areas to climate change impacts and identified opportunities for incremental and transformative adaptation (Revi et al., 2014a). The Special Report on Global Warming of 1.5°C highlighted risks in urban areas, particularly in unplanned and informal urban settlements (Hoegh-Guldberg et al., 2018). The report also pointed to multiple options for interventions in cities, such as actions related to water management, land-use and planning, and green infrastructure (Hoegh-Guldberg et al., 2018).

The inclusion of cities in climate policy reflects the extent to which mayors and local governments have exceeded in diplomatic leadership of climate debates, gaining influence in the international sphere (Acuto, 2013). However, their participation does not stop there. Cities intervene in all levels of climate change governance. This includes various activities ranging from incorporating climate change considerations in the day-to-day activities of citizens, businesses and community organizations; developing and piloting climate-friendly policies and regulations; shaping investment decisions that affect their land and environmental resources; to enrolling multiple publics in emerging forms of democratic policymaking.

There is great hope embedded in the idea that cities can look at climate policy from their citizens' practical perspectives and align climate objectives with locally-relevant co-benefits. However, these hopes also raise critical questions about local governments' capacity to respond to this challenge and the redistribution of responsibilities that this involves. This phenomenon of looking at cities as places to 'save the planet' requires understanding the particular context of urban development where climate change plays out (Angelo and Wachsmuth, 2020). The relationship between cities and climate change follows a historical

trajectory whereby climate change has become a critical area of urban intervention building on well-established ideas of local sustainability.

This overview concentrates on three aspects of climate change governance at the local level. The first section focuses on how climate change became a concern for cities, reviewing responses to one of the dominant questions in the cities and climate change governance literature: "why do cities engage with climate change?" Any answer to this question must engage with a broader understanding of how cities became the linchpin of sustainable policy in the 1990s. The second section asks instead, "what responses to climate change are mobilised in cities? " following the recent turn in the governance literature toward understanding climate governance in practice (Castán Broto and Westman, 2020). The section looks into planning, harnessing co-benefits, and finding appropriate means for evaluation. The third section looks into the insertion of cities in global circuits of knowledge production via international networks.

The recent engagement with emergency declarations - adopted by over 1500 institutional jurisdictions in 29 countries, the majority representing sub-national authorities (Ruiz-Campillo et al, 2021) - suggests a drive towards finding new ways to politicizing climate change at the local level. However, in practice, changes beyond the continuity of environmental policy are hardly visible. Nevertheless, environmental justice activists have provided multi-layered examples that show opportunities for radical action at the local level. Cities have also demonstrated their capacity to influence international discourses of climate change action through their work in city networks.

BUILDING LOCAL CLIMATE GOVERNANCE

The question of why local governments engage in climate change responses has long been central to climate governance scholarship. As argued above, this question requires examining how cities and local governments have engaged with sustainability agendas. Castán Broto and Westman (2019) situate city responses within a broader history of local action that brought together international discourses of sustainable development with concerns emerging from place-based environmental justice struggles.

Specific geographical conditions however, have shaped those histories of local action. Many pioneering examples of climate action emerged from contexts where development agendas driven by local participation ideas encountered the practical consequences of climate events. This was the case for example of the city of Manizales, Colombia, which has long been thought of as an example of citizen participation in climate adaptation and risk reduction programs (Hardoy and Barrero, 2014). Climate policy at the local level also depends on the dynamic contexts where policymaking takes place and cities' capacity to respond to external events, whether or not those external events can be attributed to climate change. For example, Rosario, Argentina, is a well-known example of a local government adopting an agroecological approach to urban agriculture. In Rosario, a series of municipal programmes have promoted urban agriculture to provide sustainable food to the city while involving poorer groups of the population and mobilizing municipal assets, such as land in marginal spaces (Dubbeling et al., 2009). Urban agriculture in Rosario is not necessarily a response to climate change, but a wider programme of action that grew out of the responses to the national outbreak of a currency, sovereign debt, and banking crisis in 2001 that led to urban populations facing unemployment and food shortages. However, it has proven to have significant benefits in terms of risk reduction and demonstrating alternatives to land management that could help reduce emissions. Both examples of Manizales and Rosario show that climate action often builds on existing trajectories of local sustainability, in line

with the demands of different geographical context and the social, economic, and ecological dynamics shaping ongoing policies.

Thus, the following analysis of cities' engagement with climate change outlines general terms that reflect the evolution of urban debates in the literature on environmental governance, rather than the actual trajectories of climate action in any specific geographies. The reader needs to consider that these observations follow the dominance of an Anglophone scholarship, whose interests have chiefly focused on more developed countries, global cities, and cities that have participated in large projects of international development. Nevertheless, the literature maps key changes:

1) the shifting role of the local in international agendas for sustainable development;
2) the growing saliency of environmental justice movements in shaping cities' policies; and;
3) the shift in climate policy from an international to a local, practical, response.

INTERNATIONAL AGENDAS FOR SUSTAINABLE DEVELOPMENT
Cities have long played a central role in international environmental policy. An official narrative of the engagement of cities in environmental actions, leading to a broader interest in climate change as a field for action, can be grounded on the vast scholarship that engaged with the delivery of Local Agenda 21. Agenda 21 followed the United Nations General Assembly resolution 44/228 of 22 December 1989 on Sustainable Development, later formalized at the United Nations Conference on Environment and Development. Agenda 21 did indeed map the participation of different actors in sustainable development and their relations, writing in its preamble:

> *It [Agenda 21] reflects a global consensus and political commitment at the highest level on development and environment cooperation. Its successful implementation is first and foremost the responsibility of Governments. National strategies, plans, policies and processes are crucial in achieving this. International cooperation should support and supplement such national efforts. In this context, the United Nations system has a key role to play. Other international, regional and subregional organizations are also called upon to contribute to this effort. The broadest public participation and the active involvement of the non-governmental organizations and other groups should also be encouraged (Agenda 21, 1992, Preamble).*

With this mandate, Agenda 21 mobilized multiple actors simultaneously. These different realms of action received attention in independent chapters. Chapter 28 established the role of local initiatives in support of Agenda 21. The keystone of action at the local level was developing 'Local Agenda 21' emerging from the consensus among multiple stakeholders and consultative processes. Whether it was a plan, a process, or a commitment to future visioning, Local Agenda 21 became a tool to think of sustainable planning at the local level, whereby global concerns could be 'localised' (Lafferty and Eckerberg, 2013).

The impact of foregrounding the role of local government was immediate. Examples of progress in delivering Local Agenda 21 plans emerged over the 1990s, although many of those experiences concentrated in European countries (Evans and Theobald, 2003; Lafferty and Eckerberg, 2013; Voisey et al., 1996). Several international initiatives grounded this work, including the increasing visibility of programs led by the International Council for Local Environmental Initiatives (ICLEI) Model Communities Programme, the development of a directory of Local Agenda 21 activities by the Council of European Municipalities and

Regions, the impulse from the 1996 Habitat II conference in Istanbul, and the consolidation of the UN Environment Programme's Sustainable Cities Programme.

The experiences of local authorities in the UK, for example, showed that, in practice, Local Agenda 21 programmes tied environmental issues to local democracy concerns, combining multiple bottom-up and top-down strategies (Selman, 1998). However, the role of Local Agenda 21 in addressing climate change was often not fully specified. At the time, policy analysis and social sciences had limited influence on climate change debates. For example, an independent report from the social sciences had to be written to complement the IPCC (see Rayner and Malone, 1998). Moreover, calls to recognize the leadership of local government authorities in sustainable development agendas raised a concern that those authorities had to exceed their resources and capacities to increase neoliberalisation and reduce the state apparatus in the 1990s (Marvin and Guy, 1997). This concern resonates with current urban studies that question the constant deferral of authority to local governments with an ever-expanding portfolio of areas for intervention (Angelo and Wachsmuth, 2020).

ENVIRONMENTAL JUSTICE DEBATES IN LOCAL CLIMATE AGENDAS

Rather than casting citizens aside of environmental problems, the Earth Summit demonstrated the centrality of environmental issues to different publics' concerns, from indigenous peoples to concerned citizens. Nevertheless, the narratives of action that followed the Earth Summit emphasized consensus at the expense of political debate and opened sustainable development to forms of technocratic appropriation (Castán Broto and Westman, 2019). The environmental justice movement was never able to fully participate- let alone lead- Local Agenda 21 processes. Instead, environmental justice emerged closely related to environmental conflicts related to the siting of large infrastructures, extractive processes, and the growing presence of pollutants especially close to disadvantaged populations (Agyeman et al., 2016). Many environmental justice movements followed a desire to influence national policy and local experience in national regulations (see, for example, Edelstein, 2018). Environmental justice groups found that urban areas and planning conflicts constituted ideal settings to articulate their views (as shown in the classic Bullard, 2018).

Nevertheless, environmental justice thinking influenced academic debates and highlighted moral questions around environmental conflicts that demonstrated the limited purchase of consensus-based notions of sustainable development. The shortcomings of dominant sustainable development discourses within Local Agenda 21 to address environmental justice and their integration within entrepreneurial notions of urban management remain at the root of sustainable development critique. Moreover, experiences of environmental conflicts in the global south called for a deeper consideration of environmental justice questions and their articulation in transnational contexts (Martinez-Alier et al., 2016; Temper et al., 2018).

Environmental justice questions have traveled into climate change and cities debates alongside the narratives mobilised in Local Agenda 21. New conceptualisations of climate justice and energy justice have emerged closely associated with previous concerns about urban development planning (Jenkins et al., 2016; Schlosberg and Collins, 2014). The need to consider a multi-dimensional notion of justice, thinking of the process of decision making and representation alongside the distributional impacts of environmental change is core to these debates (Agyeman, 2013). More recently, environmental justice scholars have progressively drawn attention to justice questions in urban environments drawing on new climate-oriented urban planning and policy agendas (Aylett, 2010; Bulkeley et al., 2013; Shi et al., 2016)

The discourses of environmental justice have permeated debates on energy access, decarbonization, and just adaptation. Still, in practice, their translation into climate policy has been more noticeable in the discourse of Just Transitions embedded in new climate policies. The problem here is that many of those debates have overlooked urban questions focusing on managing unemployment and economic transformation in fossil fuel extraction regions. For example, the European Green Deal focuses on Just Transitions to find alternatives for green economic growth in the vast regions that have depended on coal for decades (Abdullah, 2021). Discourses of Just Transition rarely engaged directly with the urban component of climate justice debates. There is a need to integrate environmental and climate justice lessons in climate policy at the local level.

THE QUESTION OF EFFECTIVENESS IN CLIMATE ACTION

The shift from a global to a local response to climate change came from the realization that cities could address climate change. Some have pointed to 2009 as a critical year of reckoning in which cities took the centre stage in climate governance (Hoffmann, 2011). As a herald of a new urban moment on climate governance, UN-Habitat's 2009 Global Report on Human Settlements on sustainability planning highlighted climate change as the key concern for cities:

> *One of the most significant environmental challenges at present is climate change. It is predicted that, within cities, climate change will negatively affect access to water and that hundreds of millions of people will be vulnerable to coastal flooding and related natural disasters as global warming increases. Moreover, it will be the poorest countries and people who will be most vulnerable to this threat and who will suffer the earliest and the most. High urban land and housing costs currently are pushing the lowest-income people into locations that are prone to natural hazards, such that four out of every ten non-permanent houses in the developing world are now located in areas threatened by floods, landslides and other natural disasters, especially in slums and informal settlements. Significantly, such disasters are only partly a result of natural forces – they are also products of failed urban development and planning* (UN-Habitat, 2009; p XXII).

This paragraph outlined many of the themes that would come to dominate debates on cities and climate change and the separation between adaptation to climate change impacts and mitigation of carbon emissions. It connects the impacts of climate change with the vulnerability of people living in urban areas, particularly in informal neighborhoods, often located in areas more exposed to natural disasters. The structural drivers of vulnerability would become a key argument in the forthcoming 2014 report of the IPCC, highlighting cities' urgent need for adaptation. The report also emphasized the extent to which cities provided a key opportunity to address climate change through planning. The planning opportunity for climate change brought together scholars in different fields to examine climate change governance in cities and settlements. Davoudi et al. (2009) called for integrating disparate work on cities and climate change, including understanding the relationship between adaptation and mitigation priorities. Subsequent work showed that climate change had become a central concern in planning theory and practice (Carter et al., 2015; Grafakos et al., 2020).

Emphasis on climate change mitigation in planning often led to the alignment of climate mitigation objectives with other urban development objectives, following sustainable development experiences at the local level. The recognition of action at the local level and the newfound role for local governance after the 2015 Paris Agreement have led to an increased

interest in the subnational contributions to global carbon emissions. We can distinguish roughly between two ways of looking at this:

- One angle is to look into the possibility of aggregating individual contributions to reducing carbon emissions in cities worldwide, developing large-scale assessments of the impact of different measures (Hsu et al., 2019).
- Another angle is to examine climate change action as part of a process of experimentation, whether this is building on previous urban policies (such as air pollution policies), developing innovative projects (of both social and technical innovation), or creating open spaces for action and urban laboratories (Bulkeley et al., 2019). If responding to climate change and decarbonizing society requires a fundamental reorganization of the material, social and cultural conditions, experimenting can open a window to those futures. Yet, there is skepticism associated with how climate experimentation seems to advance neoliberalism agendas in the climate-changed city (Edwards and Bulkeley, 2017).

These two ways of thinking depart from fundamentally different premises, but they tend to align in practice. Those who think of aggregation of results consider experimentation processes as a necessary step to consolidate climate innovations. Those who defend experimentation are not necessarily opposed to quantification, but usually suggest that quantification cannot cover the whole gamut of possible climate action. The following section focuses precisely on mapping the possibilities of climate action, as it reviews the different ways cities address climate change.

RESPONDING TO CLIMATE CHANGE ON THE GROUND

Municipal authorities have access to a variety of tools that they can use to respond to climate change. Over time, policy instruments and governance strategies have evolved and diversified. Here we focus on a few salient features of urban governance: the mobilization of planning approaches, the delivery of mitigation and adaptation actions through sectoral intervention, the work that local governments perform as mediators or enablers of action by civil society, business, or other institutions, and the growing importance of thinking about evaluating effectiveness.

URBAN CLIMATE CHANGE PLANNING

Municipal climate change plans contain long-term objectives addressing the social, economic, and ecological dimensions of climate change in the city. They may include different components of land-use planning (e.g., spatial plans for built-up space and green areas), economic development (e.g., support for strategic, green sectors), social issues (e.g., health risks linked with climate change), infrastructure development (e.g., transport), and service provision (e.g., waste management) in an urban region. Planning "serves as a synergetic vehicle that brings mitigation, adaptation, social, economic, and spatial policies into integrated focus within a single statutory plan" (Jabareen, 2015 p.42).

Climate change plans exist in different forms. They may address specific risks arising from climate change in the city, such as heatwaves or flooding. Coupled with other strategic issues, such as sustainability/environmental performance or competitiveness/growth, they may advance wider urban goals (Jabareen, 2015). Municipal climate change plans can be either brief documents that set overarching goals or detailed strategies containing targets, actions in multiple sectors, allocated budgets for implementation, and evaluation methods (Wheeler, 2008). Climate change plans can complement other urban plans (e.g., master plans,

development plans, or sustainability strategies) or exist as stand-alone documents, focusing primarily on management of public sector activities or targeting all sectors and actors in the city (Wheeler, 2008).

Urban climate mitigation planning has a more extended history than urban climate adaptation planning (Anguelovski and Carmin, 2011). The growing attention to local efforts to reduce carbon emissions followed the concentration of carbon-emitting activities in urban areas (Satterthwaite, 2008). At the time of the formulation of the first municipal climate mitigation plans in the 1990s, no standardized procedure or norm existed. Many local authorities relied on experimentation, innovation, and creativity to identify new strategies and solutions (Anguelovski and Carmin, 2011). Early municipal climate plans were often formulated as components of Local Agenda 21 (e.g. Bulkeley, 2000; Collier and Löfstedt, 1997; Tang et al., 2010; Wheeler, 2008). Toronto City Council, for example, adopted an official CO_2 reduction target in 1990 (Deangelo and Harvey, 1998). There was a strong emphasis on creating carbon inventories or other accounting methodologies in mitigation planning to tailor emission reduction plans to carbon footprints, a focus that consolidated following the Kyoto Protocol's adoption in 1997 and its ratification in 2005. Early municipal carbon inventories were frequently created with the support of municipal networks (Betsill, 2001; Bulkeley, 2000; Kousky and Schneider, 2003) (see section below), and linked with specific policy instruments actions for implementation (Wheeler, 2008).

Urban climate adaptation planning is "*the purposeful development by local governments of activities and strategies designed to reduce the effects of climate change on natural, built, and social systems*" (Hughes, 2015 p.15). Adaptation strategies have grown in importance alongside the rising knowledge about urban areas' vulnerabilities to climate change impacts, including heatwaves, storms, floods, and droughts (Revi et al., 2014b). Vulnerable urban populations include dwellers of informal settlements (areas that are underserviced or completely lack housing, water and sanitation, transport, and waste management) and the urban poor, especially in small cities in the global South (Dodman and Satterthwaite, 2008). Municipal adaptation planning draws on multiple areas of knowledge, including disaster risk reduction (Wamsler, 2006), heatwave response plans (Bernard and McGeehin, 2004), and flood protection measures (Næss et al., 2005). Adaptation planning has evolved with related concepts and approaches, such as resilient city planning (Jabareen, 2013) and ecosystem-based adaptation (Geneletti and Zardo, 2016).

While research on climate change planning initially emphasized local authorities' capacities and institutions, the focus has shifted progressively towards planning as a collaborative and collective project (Chu et al., 2016; Hughes, 2015). Such an approach means that multiple actors, such as civil society, the private sector, representatives of professional associations and academia, communities, and citizens, are involved in collaborative planning processes-much in line with sustainable development discourses in the 1990s. Forms of social and institutional innovation have emerged around climate change planning, such as climate action committees, task forces, panels, public meetings, or workshops. Community-based climate planning has also received a lot of interest. Community-based adaptation (CBA) constitutes a form of participatory planning that "identifies, assists, and implements community-based development activities that strengthen the capacity of local people to adapt to living in a riskier and less predictable climate" (Ayers and Forsyth, 2009 p.24). The inclusion of diverse actors may contribute to greater attention to equity and justice outcomes and more comprehensive plans (Lee and Painter, 2015).

Urban mitigation and adaptation planning vary in commonality across cities. Urban mitigation objectives are more common and comprehensive than adaptation agendas

(Heidrich et al., 2013; Reckien et al., 2018). The integration of mitigation and adaptation objectives is rare (Grafakos et al., 2020). A study published in 2007 established that few city governments in low and middle-income countries had taken action on adaptation (Satterthwaite et al., 2007). In 2012, an examination of 200 large and medium-sized cities in Europe found that 65% of local governments had a climate mitigation plan, while only 28% had an adaptation plan (Carmin et al., 2012b). A more recent review of 885 European cities conducted in 2018 demonstrated that 66% of local governments had a mitigation plan, while only 26% had an adaptation plan (Reckien et al., 2018). Another study from 2016, based on 401 cities worldwide, showed that only 18% of local governments (mainly in large urban areas in the global North) were engaged in adaptation planning (Araos et al., 2016). Equity and social vulnerability dimensions are often missing from urban adaptation plans (Hughes, 2015).

Several factors influence the adoption of urban climate change plans. Barriers include limited financial resources, technical capacity, and human resources (Burch, 2010; Sharma and Tomar, 2010). There is also a common problem of 'fit' when institutional actors do not recognize climate change as a local issue within municipal, departmental structures or lack the autonomy to do so (Romero Lankao, 2007). Climate change is often left aside to focus on other pressing problems (Sharma and Tomar, 2010). Factors that facilitate the adoption of plans include a political leader/champion, higher-level government support, and demands from local environmental groups (Hughes, 2015; Shi et al., 2015). A larger population, national legislation, participation in international networks, and high GDP per capita are also factors associated with higher adoption of plans (Reckien et al., 2015; Reckien et al., 2018). While early adopters were more likely inspired by endogenous variables (e.g., political leadership, knowledge of climate risk), exogenous pressures contributed to the diffusion of planning strategies across jurisdictions and geographies (Carmin et al., 2012a).

THE POWER OF CO-BENEFITS IN SECTORAL ACTIONS

Many cities take action to reduce carbon emissions beyond climate planning. Sectoral actions related to climate change in urban areas first emerged in the sectors of energy and transport. For instance, in cities in Sweden, municipal energy management plans were already adopted in response to the oil price shocks in the 1970s as a strategy to reduce fossil fuel reliance and cut costs (Collier and Löfstedt, 1997; Nilsson and Mårtensson, 2003). Establishing renewable energy portfolios and enhancing energy efficiency (primarily municipal buildings) were early actions adopted by municipal governments in countries such as the UK, Germany, Canada, and Australia. In the transport sector, interventions included adopting vehicle emission standards and transit-oriented design coupled with enhanced public transport and walking/bicycle infrastructure. Sector-based interventions in urban areas grew significantly in number after the Kyoto Protocol's ratification in 2005 (Castán Broto and Bulkeley, 2013).

Local governments often promote sector-based actions for their association with co-benefits. Co-benefits of renewable energy and energy conservation, for instance, may include cost reduction, green growth and job creation, and improved air quality (e.g. Gouldson et al., 2016). More recently, evidence has accumulated about the health co-benefits from interventions related to energy, transport, spatial design, or circular economy models (Haines, 2017; Mendez, 2015; Ramaswami et al., 2017). Climate action based on ecosystem-based adaptation, nature-based solutions, and green infrastructure may likewise produce a range of co-benefits, linked with biodiversity protection, disaster risk reduction, human health and well-being, economic development, and social justice (Kabisch et al., 2016; Raymond et al.,

2017; Robinson and Breed, 2019). Table 1 provides other examples of co-benefits of sector-based climate action in cities.

Sector	Common forms of action	Co-benefits
Power	Renewable energy portfolios, combined heat and power systems, district energy heating systems	Cost reduction (for instance, in cases where reliance on oil is linked with rising energy prices), air quality (in particular through shifts away from coal plants), energy security
Transport	Provision or management of public transport (e.g., bus rapid transit systems and rail transport), biking and walking infrastructure	Air quality, reduced congestion, road safety, health (through shifts to non-motorized transport)
Construction/ Housing	Building retrofits (e.g., for energy efficiency), building codes and standards (e.g., for energy efficiency or disaster risk reduction)	Cost reduction (public cost savings and reduced energy bills through energy savings), heat and noise insulation
Waste	Improved waste collection, recycling, waste-to-energy generation	Improved social-ecological environment, reduced health risks, improved livelihoods (where the waste picking sector can be recognized and formalized)
Urban Greening	Protection of urban ecosystems, strengthening green and blue infrastructure (e.g., waterways, green walls, and roofs), wetland restoration	Biodiversity protection, health benefits, reduced heat

Table 1. Examples of sector-based urban climate actions and associated co-benefits (source: the authors)

Sectoral approaches have been less prominent in urban climate adaptation. While mitigation plans often specify technological interventions, adaptation plans tend to focus on less tangible objectives and process-oriented goals (such as building capacity and knowledge of climate risks or enhancing stakeholder collaboration) (Carmin et al., 2012b; Castán Broto and Bulkeley, 2013; Preston et al., 2011). However, local governments have promoted urban adaptation through programs in specific sectors, such as coastal management, health, and nature conservation (Anguelovski and Carmin, 2011). Urban adaptation is also realized through specific actions, such as the construction of early warning systems, development of community disaster response plans, restoration/reinforcement of infrastructure to withstand natural hazards or increasing forest cover. Many housing, sanitation, and health care interventions reduce vulnerabilities, even if their objectives are not stated in terms of adapting to climate change.

FROM SELF-GOVERNING TO FACILITATING MULTIPLE ACTIONS
Local governments can rely on different policy instruments and actor constellations to address climate concerns in cities. The theory of *modes* of urban climate governance has sought to conceptualize the various forms of intervention available to local authorities as they collaborate with a wide range of urban actors (Bulkeley and Kern, 2006; Schroeder and Bulkeley, 2009).

Bulkeley and Kern (2006) identify four modes of governance: self-governing, governing by provision, governing by authority, and governing through enabling. This typology remains one powerful tool to understand local government interventions beyond planning and sectoral action.

Governance mode	Description
Self-governing	Self-governing refers to the efforts of local government to reduce emissions or build resilience within its operations.
Provision	Through provision, local government realizes climate action through the delivery of municipal infrastructure or services.
Authority	Authority refers to traditional forms of governing, in which local government relies on laws and regulations to address climate change.
Enabling	Enabling involves strategies through which local government addresses climate issues by facilitating or encouraging action among other stakeholders.

Table 2. Modes of urban climate governance (based on Bulkeley and Kern, 2006).

Self-governing was the most prevalent mode of governance in the early days of urban climate governance. Local governments often began their climate engagement by considering how to change activities over which they have direct control (their operations). Installing energy-efficient lamps in traffic lights, shifting fuels in public fleets, and enhancing energy efficiency or integrating renewable energy in public buildings (see examples in: Betsill, 2001; Bulkeley and Kern, 2006; Collier and Löfstedt, 1997; Schroeder and Bulkeley, 2009). Through these strategies, the municipal government assumes the role of consumer and role model, seeking to lead by example at the local level. A limitation of self-governing is that most emission activities take place beyond the public sector.

In governing through **provision**, local governments can address climate change by providing low-carbon and resilient urban infrastructure and services related to energy, transport, and sanitation. The extent to which governing through provision is effective depends on the autonomy of local government and their role in service and infrastructure provision and availability of budgetary resources (Bulkeley and Kern, 2006). In cases where a municipality owns local utilities, such interventions can have a significant impact, while privatization may erode the possibilities of such action.

Local government can also take action on climate change by relying on **authority** by issuing binding policies such as regulations, laws, land use plans, standards, codes, and ordinances. For example, building codes and standards related to energy performance have been common (Schroeder and Bulkeley, 2009). Local governments may be reluctant to rely on 'hard' governance mechanisms due to stronger regulatory powers at the national level or fear for political backlashes at the local level.

As carbon emissions derive from many actors and vulnerabilities to climate impacts extend far beyond the public sector, local governments often need to rely on **enabling** modes of governance. Enabling implies collaboration with and coordination of other stakeholders (private sector actors, communities, NGOs, and households) to realize effective climate action. It requires different forms of collaboration, such as providing information and advice, financial incentives, partnerships (informal collaboration and contractual-based), and advisory bodies (Bulkeley and Kern, 2006). A study of climate action in US cities showed that local governments are inclined to adopt interventions that either target their operations (self-governing) or that facilitate action among private actors and individuals (enabling) (Rice, 2014).

The role of cities leading by example is a central insight from the literature on experimentation discussed above (Castán Broto and Bulkeley, 2013; Smeds and Acuto, 2018). Policy experimentation at the local level can help introduce climate policy at the national level through 'bottom-up' lawmaking and shape norms and politics at the international level (Castán Broto, 2017). Some pioneering cities have become associated with leading climate solutions circulating in international debates on best practices (Table 3). These examples become ubiquitous, repeated in a variety of contexts. There is less understanding of actions that can support small, rapidly growing cities in less-resourced areas.

City	Action	Description
Durban (South Africa)	Ecosystem-based adaptation	Durban is known as a forerunner in demonstrative cost-effective community-oriented ecosystems-based adaptation (Roberts et al., 2012).
Växjö (Sweden)	Renewable energy	Through a shift towards a renewable energy mix that began in the 1980s, Växjö has become known as a pioneer in becoming a fossil-free city (Johansson, 2016).
Bogota (Colombia)	Bus Rapid Transport	The Transmilenio Bust Rapid Transport system in Bogota is promoted as a sustainable transport model, contributing to improved road safety and air quality (Hidalgo et al., 2013).
Barcelona (Spain)	Solar power	Solar thermal power heats 60% of hot water in Barcelona due to Europe's first solar thermal ordinance (Puig, 2008).
Multiple in China	Sponge cities	Sponge cities represent a new form of stormwater management to restore hydrological cycles, pioneered by cities in China (Jiang et al., 2018).

Table 3. Well-known examples of climate action in cities (Source: own elaboration)

EVALUATING EFFECTIVENESS ON THE GROUND

Monitoring and evaluation (M&E) frameworks are tools to establish whether local climate mitigation and adaptation objectives are met. As the use of urban climate planning has increased, there has been a parallel increase in interest in the impact of these plans and efforts to quantify and assess climate outcomes (Castán Broto and Westman, 2020).

Many urban climate mitigation plans are based on carbon footprints and targets for emission reductions, which means that monitoring and evaluation strategies can be linked to these objectives. Municipal climate networks incorporate reporting, monitoring, and updating mechanisms in their planning process. Currently, a range of organizations (ICLEI, the World Resources Institute, C40 Cities, the World Bank, UNEP, and UN-Habitat) promote the Global Protocol for Community-Scale Greenhouse Gas Emission Inventories (GPC) as a global reporting standard for cities to account for their emissions (ICLEI, ND-b). Various approaches exist for evaluating emission reductions of different policy strategies in cities (e.g., Lin and Zhu, 2019; Lin et al., 2010; Nishida et al., 2016). A study published in 2010 found that 70% of climate change plans in the US had monitoring, evaluation, and updating components (Tang et al., 2010). Yet, even detailed climate plans, such as London and Melbourne, have been found to lack monitoring and impact assessments (Nguyen et al., 2018).

By contrast, measuring and evaluating adaptation is significantly more difficult (Berrang-Ford et al., 2019; Ford and Berrang-Ford, 2016; Ford et al., 2015; Magnan, 2016). There is a lack of "standards, methodologies, indicators and baselines" to track whether adaptation efforts reduce vulnerabilities and enhance resilience (Ford et al., 2015 p.967). It is difficult to distinguish adaptation policies that tackle underlying vulnerabilities from interventions aimed at poverty alleviation, education, and health. Moreover, the absence of comparable units of analysis to map adaptation efforts across contexts or over time, and the lack of comprehensive datasets that capture adaptation complicate evaluation efforts (Ford and Berrang-Ford, 2016; Ford et al., 2015).

While monitoring and evaluation are necessary to ensure that urban adaptation meets formal objectives and assess whether municipal plans are credible (Olazabal et al., 2019b), the evidence suggests that the evaluation of urban adaptation plans is limited. Evaluation of adaptation policies in 136 urban agglomerations worldwide demonstrated evidence of implementation in approximately half of the cases (Olazabal et al., 2019). Examination of 44 urban adaptation plans in US cities showed that many plans fail to identify specific actions or strategies for implementation, and only 7% specified a method of evaluation (Woodruff and Stults, 2016). Monitoring and evaluation challenges are even more acute in capturing informal adaptation efforts led by various actors.

THE GROWING IMPORTANCE OF TRANSNATIONAL MUNICIPAL NETWORKS

The participation of cities in global climate change politics deserves specific attention because it has created opportunities for cities to intervene in an international sphere from within their local experiences. In particular, transnational municipal networks (TMNs) facilitate the cooperation on climate change between subnational governments, regions, and other non-state actors and help step up climate action at the local level (Andonova et al., 2009; Khan, 2013; Melica et al., 2018).

Cities are not a new actor in international relations, and they have, to an extent, always had capacities to achieve transnational reach (Curtis, 2018). However, in the last decades, with the emergence of cities in global governance, their importance in the climate arena has raised questions about their role as mediators between global concerns and place-based solutions (Fuenfgeld, 2015).

Many TMNs were explicitly set up in response to climate change and share some characteristics. For example, multinational membership is a common characteristic common to many TNMs (Busch, 2016). TNMs are most often voluntary and non-hierarchical organizations (Kern and Bulkeley, 2009; Rashidi and Patt, 2018). TMNs allow cities to create and implement urban-specific norms, practices and voluntary standards that support and complement the international legal regime on climate change (Gesing, 2018; Lin, 2018). However, previous research has shown that transnational municipal networks mainly concentrated in Europe and North America, with scarce representation from the Global South (Bansard et al., 2017).

TMNs play multiple roles. Bulkeley et al. (2003) identified four: a) representing agencies of their members at national, regional, and international forums to influence decisions that affect their members, b) disseminating knowledge and innovative practices, c) implementing higher-level policies, and d) creating and promoting policy initiatives at the local, national and international level (see also Andonova et al. 2009; Busch et al., 2018).

In general, we can differentiate between two types of TMNs according to their origin and formation: bottom-up and top-down. Bottom-up TMNs result from strategic initiatives from cities or municipalities. They create municipal groups and alliances to share experiences and best practices and to influence decisions that affect them. In contrast, top-down TNMs result from exogenous processes led by international actors or bilateral alliances, focusing on accelerating cities' responses to climate change. In both cases, participating cities gain visibility in climate governance─a strong reason for cities to join these networks (Domorenok et al., 2020a; Domorenok et al., 2020b). Both categories of TMNs have influenced international agreements and have promoted cities' mobilization, as explained below.

BOTTOM-UP NETWORKS

Many TMNs were born with generic objectives such as "reducing greenhouse gas emissions" or "combating climate change." A common assumption was that cities could mobilize a wide range of strategies, reflecting that many climate innovations were still to be developed at their inception.

The International Council for Local Environmental Initiatives (ICLEI) was a pioneering TMN. It was created after hundreds of local governments gathered at the Congress of Local Governments to a Sustainable Future organized by the United Nations Environmental Programme (UNEP) in New York. Participants were encouraged to establish a new organization to address environmental threats (WCLGSF, 1990), and this resulted in the creation of ICLEI that same year by 200 local governments from 43 countries. ICLEI is one of the first cooperation efforts between cities known in sustainable development. ICLEI's main objective ICLEI was to support local governments to transform effectively towards a greener economy (Rashidi and Patt, 2018).

With currently over 1750 local and regional governments in more than one hundred countries, the organization helped cities embark on a pathway towards low emission, nature-based, resilient and circular development. ICLEI's first programs emphasised participatory governance and sustainable local development planning. The Cities for Climate Protection (CCP) campaign, promoted by ICLEI, was the first to support cities in planning climate action to reduce greenhouse gas (GHG) emissions, improve air quality and increase sustainability and habitability. ICLEI has offices worldwide and holds annual workshops and conferences in different member cities (Rashidi and Patt, 2018). ICLEI has also enabled cities' participation in the UNFCCC COP meetings as observers (ICLEI, n.d.; ICLEI, ND-a).

Another bottom-up TMN is the Climate Alliance. It was created in 1990 after a meeting between representatives of European municipalities and indigenous Amazon organizations in Germany. The Manifesto of European Cities on an Alliance with the Amazonian Indian Peoples (August 1990) created this network to reduce energy consumption, to reduce pressures on the atmosphere, to preserve living conditions of this planet, and to act in solidarity with the indigenous people of the Amazon (Busch, 2016). The Manifesto had an objective of halving CO_2 emissions by 2010. In 2021, the Climate Alliance has more than 1700 members (Busch, 2016).

In October 2005, the Mayor of London, Ken Livingstone, brought together representatives of 18 megacities who agreed to cooperate to reduce greenhouse gas emissions. The meeting resulted in the creation of the C40 Cities Climate Leadership Group (C40). The group has grown, and it currently brings together more than 94 megacities from around the world. C40 positions itself as a network that unites megacities and cities with a very strong track record in climate action and a platform through which cities can exchange expertise and knowledge (Busch et al., 2018; Lin, 2018). C40 has increasingly focused on establishing concrete,

measurable goals. After the Paris Agreement, the C40 cities agreed that they would establish a plan to prevent the global temperature from rising by more than 1.5ºC.

Bottom-up TMNs depend on their members to formalize the network. However, international organizations and treaties have often facilitated these networks and making cities step up climate action. Although cities drive mobilization, a favorable international context has also played a role in their creation and functioning.

TOP-DOWN NETWORKS

Top-down initiatives are those promoted by international actors to mobilize cities in the fight against climate change. A well-studied example is the European Union's Covenant of Mayors for Climate and Energy (EU CoM), launched in 2008 with the European Commission's support (Domorenok et al., 2020b; Melica et al., 2018; Reckien et al., 2018). As of January 2021, EU CoM has more than 10,600 signatories, mainly from Europe but also with participation of cities from elsewhere, such as Morocco and Turkey. The initiative was launched just after the European Union adopted its climate and energy 2020 package, aimed at reducing at least 20% in GHG, increasing 20% share of renewable energies, and improving energy efficiency by 20%, all by 2020 (European Council, 2007). These goals have been updated in parallel to the subsequent compromises adopted by the EU Member States. The Covenant of Mayors also appear as a key actor in the Urban Agenda for the EU, launched with the Pact of Amsterdam (Council of the EU, 2016). The EU CoM has mobilized cities as an essential actor to achieve climate objectives. As part of their obligations in the network, signatories to the EU CoM develop an initial action plan and report progress every two years (Domorenok et al. 2020). Initiatives in cities' action plans range from transport or public lighting to residential buildings and local electricity production.

Another top-down initiative is the Compact of Mayors, launched in 2014 by the United Nations Secretary-General Ban Ki-Moon and its Special Envoy on Cities and Climate Change, Michael R. Bloomberg, in cooperation with C40 and ICLEI (European Commission, 2016; UNFCCC, 2014). This network was launched ahead of the Paris Agreement to keep the high expectation on the agreement and mobilize all sorts of actors. The Compact of Mayors and the EU Covenant of Mayors combined efforts in 2016 with the creation of the Global Covenant of Mayors for Climate and Energy (GCoM), the largest initiative of this kind, with more than 10.500 cities and local governments from 138 countries (as of January 2021). However, most of their members are cities of the European Covenant of Mayors, making the Global Covenant of Mayors a very European network.

The above shows the potential of international climate summits and agreements at the regional and global level to bring cities into climate governance. Both initiatives were born with a clear political objective from above to increase the level of effort and add more actors to international climate governance (Ruiz Campillo, 2018).

BENEFITS OFFERED BY TMNS

Previous research points to some benefits cities see in the membership of TMNs: the consolidation of a local agenda on climate governance, the support in formulating emission reduction goals, the exchange of ideas between cities, or the access to support from the networks' infrastructure (Busch et al., 2018). However, their means of operation- and hence, their benefits- are varied.

For example, the EU Covenant of Mayors provides tailored administrative and technical assistance, inform signatories on EU funding and learning opportunities through events and webinars, promote good practices at the international level, and through the EU Joint Research Centre (JRC) provides an evaluation of municipal action plans with tailored recommendations for improvements (CoM, n.d.). The participation of provinces and regions in this network has led to conversations about investments, street lighting, urban planning, or energy planning, creating a way of working with municipalities that did not exist before (Gesing, 2018). In that sense, TMNs have constituted learning platforms through which climate policy has traveled.

Cities within the EU CoM have to report every two years on improving energy efficiency, sustainable transport, or contracting environmentally friendly services and goods through green public procurement. As a result of these actions, the JRC assessed that emission reductions of the CoM signatories represent 31% of the EU-28 GHG emission reduction target by 2020 compared to 2005 (JRC, 2017). In contrast, cities have up to three years to reach the Global Covenant of Mayors' predetermined requirements. Cities sign a commitment letter, conduct an emission inventory and complete risk and vulnerability assessment, then define a goal to increase resilience and reduce GHG emissions to enable adopting an action plan (GCOM, 2021). Signatories must report on their progress regularly, although those who have accomplished one of the mentioned steps can keep their status even if they fail to reach the next steps (Gesing, 2018). Apart from developing greenhouse gas emissions inventories and creating full climate action and adaptation plans, cities in the network can access information and technical assistance to address climate change through three initiatives (i.e. Innovate4cities, Data4cities, and Invest4cities) that help cities to access financial investment and to report on climate mitigation and adaptation strategies in a standardized way. Estimates suggest that cities of the GCoM will have reduced almost 1000 tons of GHG per year by 2030, which represents 26% of what can be reduced worldwide (GCOM, 2016). While it is difficult to attribute those reductions to participation in the TMNs alone, TMNs provide means of comparison−including baselines and methodologies to quantify outcomes such as emission inventories−that enable cities to assess their performance.

Top-down initiatives like the EU Covenant of Mayors and the Global Covenant of Mayors emphasize monitoring actions and request regular reports. Nevertheless, both top-down and bottom-up networks share tactics for mobilizing cities, such as the organization of conferences, workshops, or webinars in which participants can interrelate and share experiences. ICLEI, Climate Alliance and C40 are examples of less interested networks in monitoring their members' actions than in offering them expert support, advice, and best practices to address environmental problems or promote sustainable development in cities. No matter the strategic approach, learning across contexts and experiences is the main attraction to join TMNs.

TMNs also help to build partnerships to deliver climate action, within and beyond the networks. Within the C40, cities can join to get information and technical support to monitor, measure, or respond to adaptation, air quality, energy, transport, and waste systems. C40 offers cities support to co-design initiatives, plan infrastructures, and influence citizens' behaviour. Their support may increase the impact on the implementation of programs or projects. For instance, cities can access C40 advisers to support specific climate programs and technical assistance through training, workshops, peer-to-peer collaboration, or planning tools.

TMNs may also be able to keep up to date with developments in policy discourses, adjusting them to cities' experiences. For example, ICLEI has had programs to strengthening of cities'

capacities to implement measures to achieve low carbon growth, support to cities and regions in developing renewable energy strategies, support to municipal leadership to raise awareness on environmental policy, engage municipalities in research on climate, and foster cooperation to improve air quality. Recent tools for promoting the circular economy in ICLEI include the Milan Urban Food Policy Pact, training, policy guidance, and technical expertise on city-region food systems and green public procurement. This kind of work suggests that TMNs can act as intermediaries between municipal governments and international organizations and academics to enroll cities in critical debates about delivering urban sustainability.

Climate Alliance compiles and shares campaigns that members can replicate in their cities, and has working groups on adaptation, monitoring and financing, this last one offering knowledge exchange between members on European funding programs and financing instruments. As an organization, Climate Alliance focuses on international advocacy, on the increase of the climate budget, or the ambition in international and regional organizations speaking on behalf of local authorities[1]. The network promotes the engagement of municipal administrations in climate action. It supports its members through a variety of ready-made campaigns, awareness-raising materials on sustainable mobility or renewable energy, and access to practical tools and methods for local authorities to support climate strategies and monitor progress. Inventorizing cities' action is also a critical activity to demonstrate their role in international climate policy.

Although all these initiatives have their own specific goals, they do not operate in isolation. Instead, they are profoundly interlinked. Altogether, they are a powerful tool in demonstrating local climate action and attracting attention to the role that cities can play in climate change governance. For instance, the Global Covenant of Mayors and the EU Covenant of Mayors joined in 2016, strengthening both platforms (GCOM, 2017). Another example is the promotion that the Climate Alliance makes of the EU Covenant of Mayors among local authorities while being part of the consortia managing the EU CoM. On its part, the C40 and ICLEI are partners to the GCoM.

Although each TMN may focus on a specific function, evidence suggests that all of them offer information sharing, capacity building, and regulatory support, as Andonova et al. (2009) suggested. All of the networks disseminate knowledge and have created and promoted initiatives throughout multilevel governance systems in different degrees. However, bottom-up networks (e.g., C40, Climate Alliance) have been more active in putting pressure on higher levels of actors in the multilevel system, demanding a more visible role in climate governance (C40, 2016a; C40, 2016b; C40, 2020). Top-down networks, instead, have primarily focused on promoting the adoption of higher-level policies in cities (e.g., reducing 20% GHG emissions in the case of the EU Covenant of Mayors).

The growth of TMNs signals cities' eagerness to address climate change and participate in global governance. However, the multitude of similar initiatives can also result in difficulties for effective action due to overlapping mechanisms, a consideration to be taken into account for cities that participate in several networks simultaneously.

CONCLUSION

This article charts the role of local governments in international climate policy. Current climate action builds upon a three-decade trajectory of sustainable development action at the local level. Thus, there is a lot of potential for learning from previous sustainability experiences.

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[1] See climatealliance.org for further information.

It would be an error to understand local government action as separated from the international climate change regime because actions at the local level often follow international policy events. Moreover, local successes bear a strong influence on international policy discourses. Local actors play a crucial role in addressing climate change alongside other environmental issues. Yet, cities often find themselves operating within multilevel governance arrangements, and local governments may lack autonomy or resources to deliver urban adaptation and mitigation actions.

Climate action, both in mitigation and adaptation, is often pursued because of its ability to reach several 'sustainability objectives, which are branded as co-benefits at the urban level. The 2018 IPCC Special Report of Global Warming of 1.5 Degrees Celsius argued that climate change mitigation and adaptation depend on delivering development objectives, as enshrined in the Sustainable Development Goals. It would appear that a local focus on delivering co-benefits alongside climate action would be entirely justified. Clearly, there is an increasing interest in the differential impacts of climate action and the extent to which climate change adaptation and mitigation plans affect the most disadvantaged and vulnerable populations disproportionally. Simultaneously, there is very little research that examines mitigation and adaptation actions independently from concerns about development, economic growth, or poverty alleviation. Is it even possible to imagine climate action without linking it to increments in human well-being? Recent interventions on the value of sustainable urbanization suggest the need to consider a diversity of perspectives on what that value is and how it should be identified (Castán Broto and Westman, 2019). However, recognizing the distributional impacts of climate action and different perspectives on what enhances environmental value complexifies existing climate action programs in a context of urgency.

TMNs have played an essential role in both mobilizing cities and showcasing them in an international context. The multilevel partnerships promoted through TMNs have an enormous potential to deliver climate action. At the same time, examples promoted through TMNs risk being 'the strategy' to be followed without first questioning the best approach to climate action in each city. While no one should deny the urgency of the climate change challenge, the variety of perspectives involved in governing climate change need to be incorporated into local governance. Many local governments have experience working with multiple actors in collaborative planning, consultations, and participatory processes. Cities and settlements provide hope in climate change debates because of their accessibility, their proximity to citizens. If deliberative democracy is increasingly central to deliver mitigation and adaptation outcomes, cities are uniquely positioned to make that possible. While there has been interest, there is a need for research on how participatory governance mechanisms can be deployed in the climate change policy.

Local governments can mobilize various intervention strategies, highlighting the need to enroll different actors in climate governance at the local level. Multiple tools and modes of governance can advance effective climate action in cities. There is increasing attention to justice questions and preoccupation with the lack of visibility of less dominating perspectives. Best practice examples that dominated debates in the past are increasingly regarded with skepticism, mainly because they are not appropriate in a wide range of contexts beyond where they were conceived. However, there is a limit to what can be said with confidence. There is no global plan for cities to act under climate change. Instead, cities must identify context-specific solutions that work with and for the citizens, independently from international waves of climate action.

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