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# Expanding the frontiers of climate action research in Latin America: a policy studies perspective

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## **Dossier: Expanding the frontiers of research on climate policies in Latin America**

### **Presentation**

#### **Expanding the frontiers of climate action research in Latin America: a policy studies perspective**

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Latin America has experienced increasingly frequent extreme events, which have heightened the urgency of mitigation and adaptation efforts. The region offers a rich and complex context for examining how climate action, which involves a wide array of actors operating at multiple levels, is formulated and implemented across diverse political, social, and institutional settings. Yet research on climate action grounded in policy studies in Latin America remains incipient, limiting the region's contribution to broader theoretical debates. This dossier contributes to structuring this emerging field by highlighting six key dimensions, which are discussed in this introduction. First, it shows how Latin America's specificities — its democratic trajectories, persistent inequalities, and distinctive geographies — shape the emergence and evolution of climate policies. Second, it examines cycles of policy construction, dismantling, and reconstruction, which reveal the political volatility surrounding climate commitments. Third, it underscores the differentiated levels of climate policy capacity across countries and municipalities, with implications for implementation and coordination. Fourth, it calls for deeper engagement

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with the design, diffusion, and translation of climate policy instruments, whose circulation is increasingly influenced by transnational networks. Fifth, it emphasizes the growing relevance of multilevel and transnational governance, where cities often innovate and act autonomously, sometimes in tension with national governments. Finally, it highlights the central yet unequal role of social participation, particularly given the disproportionate impacts of climate change on vulnerable populations. Together, these contributions highlight the relevance of Latin America for advancing climate policy research and underscore the value of engaging policy-studies perspectives more systematically.

**Keywords:** climate policy, climate governance, policy capacities, policy instruments, comparative public policy.

### **Expandindo as fronteiras da pesquisa em ação climática na América Latina: uma perspectiva de estudos de políticas públicas**

A América Latina tem enfrentado eventos extremos cada vez mais frequentes, o que intensificou a urgência de esforços de mitigação e adaptação. A região oferece um contexto rico e complexo para examinar como a ação climática é formulada e implementada em diferentes cenários políticos, sociais e institucionais. No entanto, as pesquisas sobre ação climática ancoradas nos estudos de políticas públicas na América Latina ainda são incipientes, limitando a contribuição da região para debates teóricos mais amplos. Este dossiê contribui para estruturar esse campo emergente ao destacar seis dimensões centrais, que são discutidas nesta introdução. Primeiro, mostra como as especificidades latino-americanas moldam a emergência e a evolução das políticas climáticas. Segundo, examina ciclos de construção, desmantelamento e reconstrução de políticas, revelando a volatilidade política em torno dos compromissos climáticos. Terceiro, evidencia os níveis diferenciados de capacidade das políticas climáticas entre países e municípios, com implicações para implementação e coordenação. Quarto, enfatiza a necessidade de aprofundar o estudo do desenho, difusão e tradução de instrumentos de política, cuja circulação é cada vez mais influenciada por redes transnacionais. Quinto, destaca a crescente relevância da governança multinível e transnacional, na qual cidades frequentemente inovam e atuam de forma autônoma. Por fim, ressalta o papel central — ainda que desigual — da participação social, especialmente diante dos impactos desproporcionais das mudanças climáticas sobre populações vulneráveis. Em conjunto, essas contribuições evidenciam a relevância da

América Latina para o avanço das pesquisas sobre políticas climáticas e reforçam a importância de incorporar de forma mais sistemática as perspectivas dos estudos de políticas públicas.

**Palavras-chave:** política climática, governança climática, capacidades de políticas, instrumentos de política, políticas públicas comparadas.

### **Expandiendo las fronteras de la investigación sobre acción climática en América Latina: una perspectiva desde los estudios de políticas públicas**

América Latina ha experimentado eventos extremos cada vez más frecuentes, lo que ha intensificado la urgencia de avanzar en los esfuerzos de mitigación y adaptación. La región ofrece un contexto rico y complejo para examinar cómo la acción climática se formula e implementa en diversos entornos políticos, sociales e institucionales. Sin embargo, la investigación sobre acción climática basada en los estudios de políticas públicas en América Latina sigue siendo incipiente, lo que limita la contribución de la región a debates teóricos más amplios. Este dossier contribuye a estructurar este campo emergente al destacar seis dimensiones clave, que son discutidas en esta introducción. Primero, muestra cómo las especificidades latinoamericanas moldean la emergencia y evolución de las políticas climáticas. Segundo, examina ciclos de construcción, desmantelamiento y reconstrucción de políticas, que revelan la volatilidad política de los compromisos climáticos. Tercero, subraya los niveles diferenciados de capacidad de las políticas climáticas entre países y municipios. Cuarto, enfatiza la necesidad de profundizar en la difusión de instrumentos de política, cuya circulación está cada vez más influida por redes transnacionales. Quinto, destaca la creciente relevancia de la gobernanza multinivel y transnacional, donde las ciudades suelen innovar y actuar de manera autónoma. Finalmente, resalta el papel central —aunque desigual— de la participación social, especialmente ante los impactos desproporcionados del cambio climático sobre las poblaciones vulnerables. En conjunto, estas contribuciones evidencian la relevancia de América Latina para el avance de la investigación sobre políticas climáticas y subrayan la importancia de incorporar de manera más sistemática las perspectivas de los estudios de políticas públicas.

**Palabras clave:** política climática, gobernanza climática, capacidades estatales, instrumentos de política, políticas públicas comparadas.

## **1. INTRODUCTION**

In May 2024, heavy rains caused flooding in several cities in the state of Rio Grande do Sul, affecting hundreds of people. Images of the inundations in Porto Alegre — once the venue of the World Social Forum — circulated widely in the international media. A month later, similar scenes of submerged streets were recorded in Germany. At the same time, a heat wave struck western India. Temperatures reached 50°C, resulting in fatalities and illnesses. Global warming has contributed to an increase in the frequency of floods and extreme heat, among other meteorological phenomena, leading to a rise in extreme climate events. In this context, public policymakers must be pressed to rapidly develop strategies for climate mitigation and adaptation, as well as to coordinate actions for managing post-disaster situations.

Climate change is a global issue that transcends national borders and affects all people on Earth, albeit to varying degrees. It demands global attention. Effectively addressing climate change requires public policies at multiple levels — local, national, and global — alongside coordinated, collective efforts. A wide range of actors from public, private, governmental, semi-governmental, intergovernmental, and non-governmental sectors, at both national and international scales, participate in shaping climate policy.

The United Nations Framework Convention on Climate Change (UNFCCC) has spent decades working to establish international carbon emissions targets and to create policy frameworks aimed at mitigating global warming. Many countries have developed specific legislation, crafted strategies, and adopted international best practices to confront climate change. Local governments have implemented climate action plans and shared tools for mitigation and adaptation. Transnational organizations such as the International Council for Local Environmental Initiatives (ICLEI) and C40 engage in advocacy and provide consulting on climate policy. Foundations such as Bloomberg Philanthropies and the Rockefeller Foundation, in turn, finance initiatives and projects across various countries. Epistemic communities, including experts from the Intergovernmental Panel on Climate Change (IPCC), have also gained prominence; they produce and disseminate knowledge on climate issues and support the coordination of global public policies. These agents interact through formal arrangements and informal networks across different levels and political arenas.

A substantial body of literature on climate policy has emerged from diverse disciplinary and interdisciplinary perspectives, encompassing technical studies in

meteorology and energy transition, as well as contributions from geography, environmental and urban studies. Alongside notions such as “climatization” (Almeida et al., 2023), recent research has applied concepts, approaches, and theories from the field of public policy studies, including super wicked problems (Levin et al., 2009), policy integration (Adelle & Russel, 2013; Biesbroek, 2021), policy diffusion (Hakelberg, 2014), policy design (Von Lüpke et al., 2023), policy dismantling (Schaub et al., 2024), citizen participation (Mazeaud, 2021; Mees et al., 2019), multi-level governance (Billi et al., 2021; Gupta, 2007; Kern, 2019; Wettestad, 2009), and climate federalism (Fenna et al., 2023), among others.

In Latin America, few studies have also examined climate change from the perspective of public policy research (Solorio, 2024). For instance, Arriagada et al. (2018) discussed the concept of polycentric climate governance in Chile, while Barton (2013) focused on citizen participation in the climate change adaptation plan in Santiago. Cid and Lerner (2023) analyzed public policy capacities in local governments in Mexico. Milhorange et al. (2022) compared Brazil and Colombia, exploring the translation of policies into climate adaptation strategies. Several Brazilian cities have also been the focus of research. São Paulo has been examined through the lens of actors’ multi-positionality (Checco & Caldas, 2019), meanwhile, Recife has been studied using an approach that combined the analysis of public policy instruments with capacities for transferring knowledge from the international to the local level (Pontieri, 2022). The role of Brazilian cities in shaping global climate policy during the 28<sup>th</sup> United Nations Climate Change Conference (COP28) has also recently been investigated (Porto de Oliveira, 2024).

Although these studies have provided valuable insights, research coordination and organization — drawing on public policy studies — to examine climate action in Latin America remains limited. Beyond recognizing the added value of research on climate action within the field of public policy, this gap also highlights several classic and contemporary questions that can deepen knowledge in the area: When do climate issues enter governmental agendas? Under what circumstances can citizens and other social groups participate in, or co-produce, climate policies together with governments? Who holds responsibility and influence in climate policy decision-making? Which transnational actors participate in different stages of the climate policy-making process? What narratives are constructed and promoted regarding climate issues? Who disseminates knowledge about climate public action instruments? What are the origins

and destinations of these instruments? How are climate policies implemented across different levels and sectors? Is there coordination among them? These are only some of the questions this dossier aspired to raise. Bringing together eight papers — and this introduction —, scholars from different Latin American countries, this dossier highlights the importance of examining climate change through the lens of policy studies. In this introduction, we discuss six key issues, emphasizing their relevance from both empirical and theoretical-conceptual perspectives: (1) the specificities of the diverse countries of Latin America and the Global South; (2) the construction, dismantling, and reconstruction of policies; (3) climate policy capacity; (4) the design and use of climate policy instruments; (5) climate governance beyond borders — multilevel, global, and transnational; (6) Social participation in climate policymaking.

## **2. LATIN AMERICAN SPECIFICITIES FOR ANALYSING CLIMATE CHANGE POLICIES**

If all countries in the world are being affected by climate change, Latin American countries have some specificities. We would like to highlight a few (among many) from the policy studies perspective. The first is related to the research agenda, where policy studies started to include climate change only more recently in Latin America and research production is still incipient, as discussed in the introduction. However, in the past two years or so, the topic has been increasingly included in different research agendas. As an example, the 14<sup>th</sup> Brazilian Political Science Association meeting in 2024, held in Salvador, was titled “Inequalities and Climate Justice: Challenges of Political Science in the Global South”. With COP 30 being held in Brazil and climate set as one of the national and international agendas of the Lula's administration, not only did the government issue different new public policies (such as the Climate Plan at the national level), but also scholars started to pay attention and include this topic in their research agendas. An empirical push might have also affected an agenda increase in the past years, due to the impacts of extreme climate events, which compelled policy studies scholars to pay attention these phenomena and the different ways governments were prepared or responded to it.

The second regards geography and geopolitics. The region has different forests, with particular attention to the Amazon, which is crucial for the global environment and climate protection. The Amazon has a shared border with a few countries in the region,

is home to different indigenous populations and holds in its territory — a part from the biodiversity — critical minerals, oil, and wood. For a long time, the Amazon region has been a place for international cooperation projects, laws for biodiverse protection, and indigenous lands demarcation. The Amazon has also been stage of relations of formal and informal, legal and illegal, collaboration and conflicts between the different parts involved in the region, which includes government, civil society, development cooperation, private sector and organized crime. From another perspective, rapid urbanization produced unequal cities all over Latin America, from Mexico City to Santiago, passing through Quito, La Paz, Fortaleza and Montevideo. Cities face different climate effects from the ocean's rise in the coasts to urban heat islands. Cities are also unequal among them, with differences in size, GDP and population.

The third dimension is related to politics, policy and public administration. Most governments have gone through dictatorships and are gaining more democratic maturity in recent years. Latin American countries deal constantly with social inequalities and poverty. For some governments, these issues are at the core of the policy agenda. Moments of policy expansion have been followed by backlash and dismantling in certain governments. Besides that, issues such as corruption, lack of infrastructure, policy coordination challenges and different levels of policy capacity, are also part of Latin American public administration landscape. Many countries in the region receive foreign aid for policy projects, either via development cooperation (from the German, Japanese or British agencies, among others) or through Multilateral Development Banks (MDBs), such as the World Bank or the Interamerican Development Bank. This can make — according to the country or city - policymaking more or less intertwined with international issues.

Understanding climate policymaking in the region involves taking these geographical, political and administrative, specifics into account. In this introduction, we will explore some of the avenues for research, mobilizing approaches and offering examples. We will discuss in the following section how policies have been built, dismantled and rebuilt over time and how scholars analyzed such phenomena in Latin America.

### **3. POLICY CONSTRUCTION, DISMANTLING AND RECONSTRUCTION**

Latin American countries have been an important venue for the policies. The Rio Earth Summit in 1992, is often considered as a mark for global climate discussions. In 2012, back again in the same city took place, the United Nations Conference on Sustainable Development Rio + 20, when member states decided to begin the discussion around the Sustainable Development Goals, which includes climate change. More than a decade later, the United Nations Biodiversity Conference COP 16 was held in Cali in Colombia in 2024 and Belém hosted in 2025 COP 30. It's worth also noting that COP25 was scheduled to take place in Chile in 2025. However, the event was handed over to Spain, due to social demonstrations taking place in Santiago. Climate policy has been for a long time discussed in international forums, where the concerns from the scientific and environmental communities originally made climate change a public problem (Blanco Wells, 2016), as well as domestically in different countries. The Paris Agreement (2015), was a milestone, inducing national and subnational governments to take the climate issue into account, particularly with the requirement of parties to formulate 'nationally determined contributions' to address global climate change. Along these years, different moments of policy construction and dismantling took place. However, studies of these processes for Latin America are still scarce.

An example of national climate policy construction analysis is Hochstetler's work on Brazil climate institutions (Hochstetler, 2021). Her study describes three stages of Brazilian climate policy. At the first stage, the Ministry of Science and Technology is made responsible for leading national efforts to respond to international commitments, such as the Kyoto Protocol to the UN Framework Convention on Climate Change (UNFCCC). Then in stage II the Ministry of Environment, empowered at the beginning of Lula's first mandate, became the most prominent actor, particularly in successful action to limit deforestation. However, this fueled local and national resistance that turned into a backlash when Bolsonaro came into power (stage III). As argued in the literature, the former president employed provisional decrees to actively weaken the climate-oriented institutions within his jurisdiction, in a process known as policy-dismantling (Milhorange, 2022). Currently, in 2025, Argentina has a negationist government with the Melei administration. Argentina, for example, moved on with initiatives to dismantle environmental protection norms, compatible with climate negationism, such as the Omnibus Law proposal brought up in 2024 (Svampa & Viale, 2023). Meanwhile, during COP 29 in Baku, Argentinian official negotiators were called to withdraw from the Summit after three days.

An important theoretical contribution of the study of Brazil is that effective climate institutions are unlikely to emerge from standardized institutional templates; rather, they will be shaped by distinct national historical-institutional trajectories and will thrive insofar as they engage the political economies embedded within those traditions (Hochstetler, 2021). This dossier contributes substantively in this direction, with case and comparative studies. In this dossier, Valdivieso-Cervera (2026) pushes this frontier with a case study of a climate adaptation plan in Cartagena (Colombia). The author examines how administrative traditions — in this case, “Napoleonic” tradition — shape collaborative governance practices. From a comparative perspective, Solorio and Ibarra, also in this dossier, analyse the diffusion climate acts in Latin America revealing a pattern of convergence and regional specificity in relation to the North. Finally, in order to shed light on the challenges that face local-level implementation of Brazil’s diplomatic agreements on climate change, Figueira et al. (2026) compare the projects led by five promotion of investments agencies (*Agências de Promoção de Investimentos*, APIs) in different subnational units in Brazil.

#### 4. CLIMATE POLICY CAPACITY

The study of policy capacities is not only one of the trending topics in policy studies, but also important to understand policymaking in Latin America. These are defined by the literature as a set of skills, resources, and competencies present within government agencies that enable the achievement of political objectives (Howlett, 2015). These capacities may be analytical, operational, or political, and can be observed at the individual, organizational, and systemic levels (Wu et al., 2015). As this powerful conceptual toolkit is not exclusive to climate policy, it raises the question of which capacity would be specific to climate change. For example, work on “climate capabilities” established “a set of characteristics that institutions should possess to effectively respond to climate change, including acting on foresight, learning and adapting, accessing resources, and using incentives to trigger change” (Shakya et al., 2018). At the policy level, the building of specific climate capacities is inherently in tension with the need to mainstream climate action (Dubash, 2021). To tackle this wicked problem, capacities located in certain organizations (and different levels) need to be put in relation with others, which proves challenging, as the literatures on environmental and climatic policy integration (Fleig et al., 2017; Schmidt & Fleig, 2018) and policy upscaling (Kern, 2019;

Kronvall et al., 2024) have largely documented for the global North. From a different perspective, Porto de Oliveira and Koga (2022, p. 8) expand the concept of policy capacity beyond the national level by introducing the notion of “capacity to transfer”, which is related to those “individual, organizational, and institutional features that can be determinants” to transfer policies. This notion can be used to understand which skills are crucial for governments to adopt, adapt and share climate policies from and to elsewhere. A recent study of the appropriation of the Chilean Climate Act by local governments shows the important disparities between municipalities on this matter in this country (Maillet et al, 2025).

Another important question is about the determinants of these capacities, and the most adequate process to build them. From a global perspective, the configuration of national climate policies is contingent upon the degree of institutional capacity and the breadth of fiscal space (Meckling & Benkler, 2024). Even though we do not have measurements available for Latin American countries for climate policy capacities, we do know about the difficulties in terms of general state capacities (Mazucca & Munck, 2020) — from which we can expect deficiencies in terms of climate policy capacities and climate action in general (Solorio, 2024).

In Latin America, differences in terms of the distribution of policy capacities can be an issue. In fact, some countries might have more capacity than others (e.g., middle powers, such as Brazil and Mexico, and small states, as Costa Rica or Jamaica, or poor states, as Haiti). The damages hurricane Melissa in Jamaica in October 2025 triggered international financial aid from the multilateral development banks for recovery (World Bank, 2025). Such uneven distribution also affects municipalities, where metropolises often have more capacity than small cities to address climate change. Such climate capacities can be of different natures and fundamental to building adaptation and mitigation policies, engaging civil society in climate policymaking, providing intersectoral coordination, and fundraising resources to projects. Studies addressing these issues can be important to better access policy capacity in the region. In the next section, policy instruments and transnational policy governance will be discussed.

## **5. UNDERSTANDING CLIMATE POLICY INSTRUMENTS: COORDINATION, INTEGRATION, DIFFUSION**

The notion of policy instruments is central to policy studies and includes different approaches (Capano & Howlett, 2020; Hood & Margetts, 2007). According to Capano and Howlett (2020), these are policy “tools, or the techniques through which governments generate, evaluate, and implement policy options”. Halpern et al. (2021) bring to the discussion the abstract dimension of policy instrument analysis, by understanding it as a device that is at the same time technical and social, which carries representations and meanings. To put it more simply, policy instruments can be understood as those elements that materialize governmental action.

There are different climate action instruments, such as climate action planning, carbon pricing, emissions auctions, green energy purchasing, recycling and waste composting, educational campaigns, and pedestrianization. Literature on climate action, of different disciplines, has been discussing these instruments without necessarily mobilizing concepts and approaches from policy studies. We understand that policy studies literature could help scholars not only to identify the origins of climate policy instruments, the interests and motivations behind their adoption or their intensity and effectiveness. The paper of Lopes and Caldas (2026), in this dossier, mobilizes the notion of procedural instruments to understand policies of agricultural adaptation to climate change. Policy studies can also be helpful to understand the different political projects (be it progressive or conservative) carried out by the agents promoting (or resisting it, such as Trump’s withdrawal from the Paris Agreement) and implementing climate action instruments.

The combination of policy studies approaches with the notion of instruments can be crucial to understanding climate action policies, tools and practices. In fact, different agents have been making an effort to coordinate, integrate, and diffuse climate action instruments, both nationally and internationally. This is the case for example, of climate action plans, which have been mushrooming in different countries and cities across the world. There are different models circulating and efforts of organizations to standardize climate action plans. This is evident on what regards cities, insofar as some of the main agents promoting climate action plans are transnational networks such as Iclei and C40. In this regard, the notion of ‘standardization’ can be useful for analysing how climate policy instruments spread. Ancelovici and Jenson (2012), for example, focus on the early stages of transnational policy transfer, describing how local ideas and practices are transformed into ‘standard models’ through certification, framing, and decontextualization.

Policy transfer, diffusion and circulation studies can also offer important lenses to analyse the nature and transnational strategies of such agents, as well as trajectories and translations of policy instruments (Porto de Oliveira & Osorio, 2023). It could help, for example, to understand how climate action instruments emerge, where these are adopted and where they stopover in the diffusion pathway. The notion of policy translation, can be useful to understand the way policy instruments are adjusted, combined, and reinvented not only along the transfer process, but also when it meets different local contexts in the global north and south. In the next section, the transnational dimension of climate change will be discussed through the lenses of multilevel and global governance.

## **6. CLIMATE GOVERNANCE BEYOND BORDERS: MULTILEVEL, GLOBAL, TRANSNATIONAL**

An extreme climate event might cross different countries, showing “little respect” for national borders and jurisdictions. International and global policy coordination is needed — even though not simple — to address climate change. The G20, as well as the BRICS+, have groups on climate change where members address different issues from air pollution to risk management, passing through just transition. Climate change is currently the major policy problem affecting humanity, requiring global collective action. It is at the core of the United Nations agenda, through different initiatives and programs, such as the Sustainable Development Goal (SDG) 13. The venue par excellence of concertation for climate action is the Conference of the Parties (COPs), where diplomats and national representatives try to coordinate climate issues, create norms, standards and targets (such as the Paris Agreement and the NDCs). In parallel to the deliberations taking place by national and international authorities during COP's official agenda events, thousands of participants from the private sector, academia and civil society show up to discuss, contest and propose innovations on climate policymaking and action.

Latin America doesn't offer only an empirical setting for analysing multilevel, global and transnational climate governance, but also a testing ground for conceptual and theoretical innovations. One example is the use of the idea of transnational policy space, which was built on the concept of “policy transfer space” (Porto de Oliveira & Osorio, 2023). It can refer to a combination of different venues, within and beyond national borders, where agents discuss, deliberate, legitimize, resist, contest, share ideas, knowledge models, and coordinate actions related to a specific policy topic that is part of

the policy process. Transnational policy space can serve as a conceptual tool to understand the different gatherings for climate discussion. In fact, policy and social agents attend and organize different types meetings and events of national (be it a municipal discussion at the city hall or a national deliberation at the congress) and international scale, such as the New York or London Climate Week, the COP for biodiversity, the Iclei or C40 World Congresses, the G20 Working Group meetings, and the UNFCCC meetings in Bonn. This concept can be useful to understand how the policy process operates in multiple venues and levels, as well as how agents behave to coordinate their policy actions in this realm.

The notion of multi-level governance (Croese et al., 2021; Hooghe & Marks, 2001; Jordan et al. 2012) is crucial to understand the dynamics of policy cooperation and conflict between global, national and subnational agents. If national authorities are those entitled to take part in global climate policymaking, especially in the UN activities, but also to take credit in multilateral development banks (such as IDB or the WB), local authorities have been advocating for more representation in such political and financial processes for a long time. During the COP 28 in Dubai a global policy was launched to address this issue. The Coalition for High Ambition Multilevel Partnerships (CHAMP), introduced by the COP28 Presidency in partnership with Bloomberg Philanthropies, was created to strengthen cooperation between national and subnational governments on climate policy and financing, and now is endorsed by 78 states.

Champ is also an example of a Global Public Policy (Stone, 2019), a concept that also offers valuable analytical capacity to observe climate action at the international level, such as the Paris Agreement or the Sendai Framework for Disaster Risk Reduction. Global pressures affect governmental bodies in different ways and can be intrinsically intertwined with domestic policy and political variables. In this dossier, the article of Grisa et al. (2026) focuses on the connection between climate change and food security and nutrition. The authors discuss how external pressures, governmental shifts, and differing interpretations within ministerial communities produced varying timelines and policy responses to climate change.

Understanding how multi-level climate governance is implemented in Latin America can also be interesting from the perspective of climate federalism, which allows us to understand also the national vertical and horizontal actions to tackle climate change. In fact, the region has different federal systems, including Argentina, Brazil and Mexico. Climate federalism studies can be used to understand policy experimentation, learning

and veto points performing to policy obstruction (Fenna et al., 2023), as well as policy coordination and conflict between national and subnational levels. In the past years, cities have been producing innovations in climate change solutions, sharing urban climate knowledge and engaging in cross-national decentralized cooperation with each other. Often, cities bypass their national governments and relate with their peers abroad, despite official state positions related to climate change. This is the case of the United States movement “America is all in”, which was created to keep the commitments the country had signed with the Paris Agreement, despite the national government withdrawing in 2017 and 2023. The urban international engagement is not limited to North America countries, as a matter of fact, cities such as Bogotá, Rio de Janeiro and Buenos Aires have been very active in international arenas. The notion of paradiplomacy (Aldecoa & Keating, 1999), which refers to the international engagement of subnational governments, can be useful to observe this empirical setting in Latin America. The article of Figueira et al. (2026), in this dossier, discusses this topic by combining a global and local perspective.

## **7. SOCIAL PARTICIPATION IN CLIMATE POLICYMAKING**

The effects of climate change don't affect people in the same way. The vulnerable citizens suffer the most. However, society is not often called to participate in climate policy decision-making. On the one hand, various social groups, including young people, peasants, and others (besides the aforementioned local authorities), have been advocating for greater participation in addressing climate change. On the other hand, governments and non-governmental organizations have been developing and diffusing climate democratic policy models to be implemented at different levels.

COP 30 reveals an important transnational policy space for observing how climate negotiations and arenas are open to civil society participation and, more broadly, to look at climate democracy operating at a global level. After a few rounds of COPs taking place in authoritarian regimes, Dubai and Baku, with little space for activists, Brazil offered an important ground for social movements. In fact, social movements engaged in demonstrations using different strategies in Belém, from occupying the river with coloured boats to an attempt to invade the Blue Zone. Civil society also organized the People's Forum in parallel to COP 30.

There has historically been a technical component that values the knowledge of experts, both in adaptation and mitigation solutions, as well as in measuring the impacts and forecasting the effects of climate change in the long term and the probability of extreme climate events occurring in the short term. However, Indigenous knowledge and voices have been progressively included in the debate (Foyer & Dumoulin, 2017). As an example, the indigenous activist Txai Suruí gave a speech at the opening of the COP26 in Glasgow. Indigenous participation has boosted at COP 30, when, according to event information, at least 5,000 Indigenous people participated in the debates in various ways: 3,500 members of Indigenous communities stayed at the COP Village, 360 Brazilian Indigenous people were part of the Brazilian delegation in the Blue Zone, and around 500 delegates from other Indigenous organizations and from other countries were present in the COP30 Blue Zone (United Nations Climate Change, 2025).

In this dossier, Jorquera and Cares (2026) bring indigenous knowledge and participation in climate policymaking. Their article addresses the narratives about indigenous women in climate governance that underlie the main policy instruments associated with the Framework Law on Climate Change (LMCC). Interwoven with discourses of vulnerability and images of Indigenous women as beneficiaries of climate policy, there is also a narrative that acknowledges Indigenous women's knowledge. However, this recognition does not translate into their acknowledgment as actors in climate change governance in Chile, but rather positions them as recipients of a fragmented and disjointed policy.

Climate governance is also a testing ground for innovations and there have been different initiatives attempting to address the climate issue. The Climate Democracy Accelerator program of the organization People Powered focuses on training and supporting civil society organizations in Global South countries in a participatory process towards just transition (People Powered, s.d.). The French Citizens' Convention on Climate, along with the Climate Assembly UK, are also examples of experiences including society in the climate issue through democratic innovations (Willis et al., 2022). The article by Solorio et al. (2026) examines the different ways in which national governments in Latin America have incorporated participation into their climate legislation, beyond the use of citizen consultation mechanisms. Participatory approaches range from the inclusion of social actors in interinstitutional coordination bodies in Colombia, Guatemala, Honduras, Nicaragua, Paraguay, and Peru, to the establishment of external advisory commissions to the executive in Mexico, Argentina, and Chile, and the

creation of “Consultative Chambers” for Social Participation and Scientific Advisory in Brazil. Some municipal climate action plans have been developed through dialogue with civil society, while others have integrated participatory components. An example is the city of Campinas, where civil society can engage in climate governance through technical chambers, fostering an ongoing dialogue with the government (Prefeitura Municipal de Campinas, 2024, p. 117).

Latin American countries have been an important hotbed for democratic innovation, such as Participatory Budgeting (Porto de Oliveira, 2017, Wampler, 2008). Analysing how governments will include participatory components in climate change governance in the region offers an important set for understanding the transformation of the state and policymaking, under times of climate pressure. However, it is important to note that ancient indigenous inclusive and collaborative practices of environmental care and protection have been in place for long. Observing if and how such practices will or will not be taken into consideration by governments and international organizations in climate policymaking also offers an important research avenue.

## 8. CONCLUSION

When the Call for Papers for this Dossier was first drafted in 2024, we referred to the extreme climate event in Rio Grande do Sul, which at the time had shocked Brazil by affecting most municipalities across the entire state. It is easy to recall how this example was repeatedly invoked during various climate-related events held in the country, such as the ICLEI World Congress in São Paulo. As we finalize this introduction, another severe event has unfolded: a series of massive tornadoes devastated the city of Rio Bonito in Paraná, coinciding with the COP Leaders’ Summit taking place in Belém in early November 2025. As extreme climate events occur with increasing frequency and often without warning, addressing climate change becomes an unavoidable concern for anyone engaged in policymaking. Although research on climate change has expanded across numerous disciplines, only a small share of this work draws on policy studies literature.

With this dossier, we aim to highlight the value of policy studies for understanding the micro-, meso-, and macro-level dynamics of climate change, as well as the interactions among diverse actors, governance levels, and institutional arenas. Policy studies offer a rich set of analytical approaches — from classic frameworks such as Multiple Streams and Advocacy Coalitions, to more contemporary perspectives on policy

transfer, diffusion, circulation, and policy instrument or transnational space analysis. Latin America provides not only an important testing ground for these approaches but also a fertile empirical context in which scholars can develop conceptual, methodological, and theoretical innovations and open new research avenues. Bringing together knowledge generated by Latin American scholars from different fields can also foster the development of contextually grounded and insightful approaches that advance the analysis of climate policies in the Global South and beyond.

Latin American climate action research in policy studies is still an emerging field, where many issues are yet to be tackled. For example, there is legitimate doubt whether the traditional difference between mitigation and adaptation still holds up. Another important subfield of policy studies that still requires more work in climate policy is implementation and evaluation. As reflected in many of the contributions to this dossier, scholarship continues to concentrate largely on planning (Madariaga et al., 2025) and design, and new contributions can be made on the actual changes generated by these instruments in day-to-day policymaking. We hope that this dossier and its contributions will encourage researchers to examine climate action in Latin America through the lens of policy studies and further enrich the scholarly debates in this field.

## REFERENCES

- Adelle, C., & Russel, D. (2023). Climate Policy Integration: A case of déjà vu? *Environmental Policy and Governance*, 23(1), 1-12. <https://doi.org/10.1002/eet.1601>
- Aldecoa, F., & Keating, M. (1999). *Paradiplomacy in Action: The Foreign Relations of Subnational Governments*. Psychology Press.
- Almeida, P., González Márquez, L. R., & Fonsah, E. (2024). The forms of climate action. *Sociology Compass*, 18(2), e13177. <https://doi.org/10.1111/soc4.13177>
- Ancelovici, M., & Jenson, J. (2012). La standardisation et les mécanismes du transfert transnational. *Gouvernement et Action Publique*, 1(1), 37-58. <https://doi.org/10.3917/gap.121.0037>
- Arriagada, R., Aldunce, P., Blanco, G., Ibarra, C., Moraga, P., Nahuelhual, L., O’Ryan, R., Sapiains, R., & Sepúlveda, C. (2018). Climate change governance in the

Anthropocene: Emergence of polycentrism in Chile. *Elementa: Science of the Anthropocene*, 6, 68. <https://doi.org/10.1525/elementa.329>

Barton, J. R. (2013). Climate change adaptive capacity in Santiago de Chile: Creating a governance regime for sustainability planning. *International Journal of Urban and Regional Research*, 37(6), 1916-1933. <https://doi.org/10.1111/1468-2427.12066>

Biesbroek, R. (2021). Policy integration and climate change adaptation. *Current Opinion in Environmental Sustainability*, 52, 75-81. <https://doi.org/10.1016/j.cosust.2021.07.003>

Billi, M., Moraga, P., Aliste, E., Maillet, A., O’Ryan, R., Sapiains, R., Bórquez, R., Aldunce, P., Azócar, G., Blanco, G., Carrasco, N., Galleguillos, M., Hervé, D., Ibarra, C., Gallardo, L., Inostroza, V., Lambert, F., Manusevich, D., & Mart, A. (2021). *Gobernanza climática de los elementos*. Centro de Ciencia del Clima y la Resiliencia (CR2).

Blanco Wells, G. (2016). Abriendo la caja negra del cambio climático: Claves para comprender su trayectoria política en América Latina. In A. Lampis (Ed.), *Cambio ambiental global, Estado y valor público: La cuestión socio-ecológica en América Latina, entre justicia ambiental y “legítima depredación”* (pp. 45-66). Universidad Nacional de Colombia.

Capano, G., & Howlett, M. (2020). The Knowns and Unknowns of Policy Instrument Analysis: Policy Tools and the Current Research Agenda on Policy Mixes. *SAGE Open*, 10(1). <https://doi.org/10.1177/2158244019900568>

Checco, G. B., & Caldas, E. de L. (2019). Governos subnacionais e a política de mudanças climáticas de São Paulo: Uma análise a partir da multiposição dos atores na cidade de São Paulo. *Confins*, (39). <https://doi.org/10.4000/confins.18247>

Cid, A., & Lerner, A. M. (2023). Local governments as key agents in climate change adaptation: Challenges and opportunities for institutional capacity-building in Mexico. *Climate Policy*, 23(5), 649-661. <https://doi.org/10.1080/14693062.2023.2201804>

Croese, S., Greenhalgh, K., & Dassah, M. (2021). Bringing the global to the local: The challenges of multi-level governance for global policy implementation in Africa.

*International Journal of Urban Sustainable Development*, 13(3), 435-447.  
<https://doi.org/10.1080/19463138.2021.1966591>

Dubash, N. K. (2021). Varieties of climate governance: The emergence and functioning of climate institutions. *Environmental Politics*, 30(sup1), 1-25.  
<https://doi.org/10.1080/09644016.2021.1979775>

Fenna, A., Jodoin, S., & Setzer, J. (2023). Climate Governance and Federalism: An Introduction. In A. Fenna, J. Setzer, & S. Jodoin (Orgs.), *Climate Governance and Federalism: A Forum of Federations Comparative Policy Analysis*. Cambridge University Press.

Figueira, A. R., Russo, E., & Rocha, G. G. (2026). Transformando compromissos globais em ações locais: os desafios de governança na implementação da agenda climática. *Revista de Administração Pública*, 60(sup1), e2024-0396. <https://doi.org/10.1590/0034-761220240396>

Fleig, A., Schmidt, N. M., & Tosun, J. (2017). Legislative dynamics of mitigation and adaptation framework policies in the EU. *European Policy Analysis*, 3(1), 101-124.  
<https://doi.org/10.1002/epa2.1002>

Foyer, J., & Dumoulin Kervran, D. (2017). Objectifying traditional knowledge, re-enchanting the struggle against climate change. In S. C. Aykut, J. Foyer, & E. Morena (Eds.), *Globalising the climate: COP21 and the climatisation of global debates* (pp. 153-172). Routledge.

Grisa, C., Severo, C. M., & Vasconcelos, F. C. F. (2026). Mudanças climáticas e alimentação na agenda dos ministérios brasileiros. *Revista de Administração Pública*, 60(sup1), e2024-0476. <https://doi.org/10.1590/0034-761220240476>

Gupta, J. (2007). The multi-level governance challenge of climate change. *Environmental Sciences*, 4(3), 131-137. <https://doi.org/10.1080/15693430701742739>

Hakelberg, L. (2014). Governance by Diffusion: Transnational Municipal Networks and the Spread of Local Climate Strategies in Europe. *Global Environmental Politics*, 14(1), 107-129. [https://doi.org/10.1162/GLEP\\_a\\_00216](https://doi.org/10.1162/GLEP_a_00216)

Halpern, C., Lascoumes, P., & Le Galès, P. (2021). As abordagens a partir dos instrumentos da ação pública. In O. Porto de Oliveira, & P. Hassenteufel (Orgs.), *Sociologia política da ação pública: teorias, abordagens e conceitos*. ENAP.

Hochstetler, K. (2021). Governance by Diffusion: Transnational Municipal Networks and the Spread of Local Climate Strategies in Europe. *Environmental Politics*, 30(sup1), 49-70. <https://doi.org/10.1080/09644016.2021.1957614>

Hood, C., & Margetts, H. (2007). *The tools of government in the digital age*. Palgrave Macmillan.

Hooghe, L., & Marks, G. (2001). *Multi-level governance and European integration*. Rowman & Littlefield Publishers.

Howlett, M. (2015). Policy analytical capacity: The supply and demand for policy analysis in government. *Policy and Society*, 34(3-4), 173-182.

Jordan, A., Huitema, D., Hildén, M., van Asselt, H., Rayner, T. J., Schoenefeld, J. J., Tosun, J., Forster, J., & Boasson, E. L. (2012). Understanding the paradoxes of multilevel governing: Climate change policy in the European Union. *Global Environmental Politics*, 12(2), 43-66. [https://doi.org/10.1162/GLEP\\_a\\_00108](https://doi.org/10.1162/GLEP_a_00108)

Jorquera, R. Y., & Cares, F. C. C. (2026). Gobernanza climática y mujeres indígenas, narrativas desde la institucionalidad y perspectivas propias. *Revista de Administração Pública*, 60(sup1), e2024-0456. <https://doi.org/10.1590/0034-761220240456>

Kern, K. (2019). Cities as leaders in EU multilevel climate governance: Embedded upscaling of local experiments in Europe. *Environmental Politics*, 28(1), 125-145. <https://doi.org/10.1080/09644016.2019.1521979>

Kronvall, A., Haupt, W., & Kern, K. (2024). Transformative climate governance in small Swedish municipalities: Exploring the cases of Enköping and Kiruna. *Environmental Policy and Governance*, 34(4), 339-351. <https://doi.org/10.1002/eet.2086>

Levin, K., Cashore, B., Bernstein, S., & Auld, G. (2009). Playing it forward: Path dependency, progressive incrementalism, and the “super wicked” problem of global

climate change. *IOP Conference Series: Earth and Environmental Science*, 6(50), 502002. <https://doi.org/10.1088/1755-1307/6/50/502002>

Lopes, M. V., & Caldas, E. L. (2026). Instrumentos de políticas públicas, inovação institucional e adaptação da agricultura às mudanças climáticas no Brasil. *Revista de Administração Pública*, 60(sup1), e2024-0473. <https://doi.org/10.1590/0034-761220240473>

Madariaga, A., Maillet, A., & Tapia, D. (2025). Climate Planning Across Latin America. In P. Almeida (Ed.), *The Oxford Handbook of Climate Action*. Oxford. <https://doi.org/10.1093/oxfordhb/9780197762097.013.0028>

Maillet, A., Orrego-Méndez, G., Pogorelow, B., Espíndola-Vergara, L., Ibarra, C., Osorio, C., Saa Vidal, R., Fernández, G., & Palacios Cerón, L. (2025). Desafios de la acción climática local: El caso de la formulación de los planes de acción comunal de cambio climático en Chile. *Revista de Gestión Pública*, 14, 37-58. <https://doi.org/10.22370/rgp.2025.14.1.4724>

Mazeaud, A. (2021). Gouverner la transition écologique plutôt que renforcer la démocratie environnementale : Une institutionnalisation en trompe-l'œil de la participation citoyenne. *Revue Française d'Administration Publique*, 179(3), 621-637. <https://doi.org/10.3917/rfap.179.0143>

Mazucca, S., & Munck, G. (2020). *A middle-quality institutional trap: Democracy and state capacity in Latin America*. Cambridge University Press.

Meckling, J., & Benkler, A. (2024). State capacity and varieties of climate policy. *Nature Communications*, 15(1), 9369. <https://doi.org/10.1038/s41467-024-54221-1>

Mees, H. L. P., Uittenbroek, C. J., Hegger, D. L. T., & Driessen, P. P. J. (2019). From citizen participation to government participation: An exploration of the roles of local governments in community initiatives for climate change adaptation in the Netherlands. *Environmental Policy and Governance*, 29(3), 198-208. <https://doi.org/10.1002/eet.1847>

Milhorance, C. (2022). Policy dismantling and democratic regression in Brazil under Bolsonaro: Coalition politics, ideas, and underlying discourses. *Review of Policy Research*, 39(6), 752-770. <https://doi.org/10.1111/ropr.12502>

Milhorance, C., Howland, F., Sabourin, E., & Le Coq, J.-F. (2022). Tackling the implementation gap of climate adaptation strategies: Understanding policy translation in Brazil and Colombia. *Climate Policy*, 22(9-10), 1113-1129. <https://doi.org/10.1080/14693062.2022.2147837>

People Powered. (s.d.). *Climate Democracy Accelerator*. <https://www.peoplepowered.org/climate-democracy-accelerator>

Pontieri, H. C. (2022). *A tradução da agenda global de mudança do clima para o contexto local e as capacidades: Um estudo sobre o caso de Recife* [Dissertação de Mestrado, Universidade de São Paulo]. Repositório Institucional da USP. <https://doi.org/10.11606/D.101.2022.tde-26122022-154817>

Porto de Oliveira, O. (2017). *International policy diffusion and participatory budgeting: Ambassadors of participation, international organizations and transnational actors*. Palgrave Macmillan.

Porto de Oliveira, O. (2024). *Transnational climate urban action: Brazil and the COP28*. In *Proceedings of the Conference On Policy Process Research*, Syracuse University, Syracuse, NY, United States of America.

Porto de Oliveira, O., & Koga, N. M. (2022). Policy transfer capacity: The role of individuals, organizations and systems on the adoption and internationalization of policy instruments. *Administrative Theory & Praxis*, 45(1), 1-19. <https://doi.org/10.1080/10841806.2022.2144342>

Porto de Oliveira, O., & Osorio, C. G. (2023). Comparative Transfer Analysis: Policy Instruments, Space and Time. *Journal of Comparative Policy Analysis: Research and Practice*, 25(4), 367-384.

Prefeitura Municipal de Campinas. (2024). *Plano Local de Ação Climática: Campinas/SP*. <https://portal->

[adm.campinas.sp.gov.br/sites/default/files/secretarias/arquivos-avulsos/142/2024/06/27-084218/PLAC\\_Campinas\\_Padr%c3%a3o.pdf](http://adm.campinas.sp.gov.br/sites/default/files/secretarias/arquivos-avulsos/142/2024/06/27-084218/PLAC_Campinas_Padr%c3%a3o.pdf)

Schaub, S., Tosun, J., & Jordan, A. J. (2024). Climate action through policy expansion and/or dismantling: Country-comparative insights: An introduction to the special issue. *Journal of Comparative Policy Analysis: Research and Practice*, 26(3-4), 215-232. <https://doi.org/10.1080/13876988.2024.2346747>

Schmidt, N. M., & Fleig, A. (2018). Global patterns of national climate policies: Analyzing 171 country portfolios on climate policy integration. *Environmental Science and Policy*, 84, 177-185. <https://doi.org/10.1016/j.envsci.2018.03.003>

Shakya, C., Cooke, K., Gupta, N., Bull, Z., & Greene, S. (2018). *Building institutional capacity for enhancing resilience to climate change: An operational framework and insights from practice*. Action on Climate Today. <http://www.acclimatise.uk.com/wp-content/uploads/2018/02/GIP01916-OPM-Strengthening-institutions-Proof4-web.pdf>

Solorio, I. (2024). The ABCs of governmental climate action challenges in Latin America. *NPJ Climate Action*, 3, 6. <https://doi.org/10.1038/s44168-023-00083-0>

Solorio, I., Ibarra, C., Guzmán, J., & Pogorelow, B. (2026). La difusión de legislación climática en América Latina: tendencias regionales, particularidades nacionales. *Revista de Administração Pública*, 60(sup1), e2024-0441. <https://doi.org/10.1590/0034-761220240441>

Stone, D. (2019). *Making global policy*. Cambridge University Press.

Svampa, M., & Viale, E. (2023, 28 de dezembro). Regresión ambiental, desdemocratización y estado de excepción. *El Diario AR*. [https://www.eldiarioar.com/politica/regresion-ambiental-desdemocratizacion-excepcion\\_1\\_10800840.html](https://www.eldiarioar.com/politica/regresion-ambiental-desdemocratizacion-excepcion_1_10800840.html)

United Nations Climate Change. (2025, 1 de dezembro). *COP com maior participação indígena da história viabiliza proteção de territórios e mecanismos de fortalecimento da pauta*. COP30. <https://cop30.br/pt-br/noticias-da-cop30/cop-com-maior-participacao->

indigena-da-historia-viabiliza-protacao-de-territorios-e-mecanismos-de-fortalecimento-da-pauta

Valdivieso-Cervera, G. E. (2026). The Napoleonic footprint: how administrative tradition influenced collaborative climate adaptation in Cartagena, Colombia. *Revista de Administração Pública*, 60(sup1), e2024-0474. <https://doi.org/10.1590/0034-761220240474x>

von Lüpke, H., Leopold, L., & Tosun, J. (2023). Institutional coordination arrangements as elements of policy design spaces: Insights from climate policy. *Policy Sciences*, 56(1), 49-68. <https://doi.org/10.1007/s11077-022-09485-6>

Wampler, B. (2008). When does participatory democracy deepen the quality of democracy? Lessons from Brazil. *Comparative Politics*, 41(1), 61-81. <https://doi.org/10.5129/001041508X12911362383193>

Wettestad, J. (2009). European climate policy: Toward centralized governance? *Review of Policy Research*, 26(3), 311-328. <https://doi.org/10.1111/j.1541-1338.2009.00385.x>

Willis, R., Curato, N., & Smith, G. (2022). Deliberative democracy and the climate crisis. *Wiley Interdisciplinary Reviews: Climate Change*, 13(2), e759. <https://doi.org/10.1002/wcc.759>

World Bank. (2025, November 7). *Hurricane Melissa triggers 100% payout of \$150 million World Bank Catastrophe Bond for Jamaica* (Press Release). <https://www.worldbank.org/en/news/press-release/2025/11/07/hurricane-melissa-triggers-100-payout-of-150-million-world-bank-catastrophe-bond-for-jamaica>

Wu, X., Ramesh, M., & Howlett, M. (2015). Policy capacity: A conceptual framework for understanding policy competences and capabilities. *Policy and Society*, 34, (3-4), 165-171.

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