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in Latin America and the Caribbean**

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ANDREW YOUNG SCHOOL
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Decentralized Governance and Climate Change in Latin America and the Caribbean

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Abstract

This paper looks at climate change in decentralized Latin American and Caribbean countries to address two main goals. First, to systematize the main subnational climate initiatives in fiscal decentralization, administrative decentralization, and intergovernmental coordination implemented in the LAC region. Second, to contribute prospectively with potential lines of action related to decentralization and climate change policy measures that will make it possible to sustain the current achievements, as well as to manage climate related risks in the future. Three central questions are explored: How involved have subnational governments been in managing the response to climate change in terms of mitigation and adaptation in LAC? What fiscal decentralization policies and instruments support the development and implementation of SNG climate actions? What policies and instruments of administrative decentralization support the development and implementation of the SNGs climate actions? The authors offer a series of seven prospective actions to address these questions.

Keywords: fiscal decentralization, climate change, Latin America, Caribbean

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1 How involved have subnational governments been in managing the response to climate change in terms of mitigation and adaptation in LAC?

Urban areas are responsible for between 71 and 76 percent of CO₂ emissions from global energy end-use and are particularly affected by adverse weather events.¹ According to the C40 database, the most likely climate change-related threats that cities in Latin America and the Caribbean (LAC) region face are: “...*heat waves (67% of cities), flooding (57%), water stress and drought (47%), weather-related fire (39%), diseases (35%), landslides (28%). Cold waves and sea-level rise are less felt effects; likewise, atmospheric pollution resulting from emissions where only 28 out of 116 cities in 10 LAC countries declare it as a threat*” (Siclari, 2020).² Given their high population density, management of decarbonization and climate resilience in cities are particularly relevant.

The role of subnational governments (SNGs) in the climate change agenda has received the attention of the climate change and environmental literature, though it has been relatively absent of the public finance literature and, at a more practical level, of the decentralization processes in the region.³ However, expenditure responsibilities assigned to SNGs have an impact on climate change mitigation and/or adaptation to climate. Similarly, the tax base of some tax and non-tax revenues of SNGs is related to economic activities or to the consumption of products that may have a negative environmental effect. On the other hand, although intergovernmental transfers linked to natural resources have an economic rationale to compensate SNGs for negative environmental and social externalities incurred where natural resources are extracted from, this

¹ (UN Habitat, 2021)

² C40 is a network of mayors from nearly 100 of the world's leading cities collaborating to take the urgent action needed right now to address the climate crisis. Available at (C40, 2021)

³ For an example studying the role of SNGs in climate change adaptation and mitigation from a public finance perspective, see Martinez Vazquez and Smoke (2020)

rationale is rarely invoked in their design and implementation. In turn, although many SNGs in the region have the possibility of accessing public debt, climate finance is barely utilized in the region. This situation is compounded by relatively limited knowledge of SNG vis-à-vis central governments on climate change, and generally weak management capacities, as well as lack of mechanisms to facilitate transparency and accountability of public spending with a climate impact.

In summary, climate change is an increasingly relevant fiscal risk, both at the national and subnational levels, imposing unplanned expenditures; revenue losses caused by the disruption of economic activities, as well as increases in public debt.⁴

In this context, this chapter has two objectives:

1. Systematize the main subnational climate initiatives in fiscal decentralization, administrative decentralization, and intergovernmental coordination implemented in the LAC region.
2. Contribute prospectively with potential lines of action related to decentralization and climate change policy measures that will make it possible to sustain the current achievements, as well as to manage climate related risks in the future.

Three more sections follow. The second and third sections summarize the main fiscal and administrative decentralization dimensions related to climate change in the LAC region, respectively, following the framework defined in Martínez-Vázquez (2021) and Smoke and Cook (2022), with relevant subnational examples from the LAC region in each dimension. The fourth section delineates potential lines of action related to decentralization and climate change policies based on the main findings of this research.

⁴ (OECD & The World Bank, 2019)

2 What fiscal decentralization policies and instruments support the development and implementation of SNG climate actions?

2.1 Allocation of roles and responsibilities for climate-relevant expenditures at the subnational level

Over the last 40 years, two uncorrelated phenomena have coincided in LAC to increase the relevance of SNGs in the adoption of policies to mitigate and adapt to climate change. On the one hand, the share of subnational governments in total government spending has doubled, passing from 13 percent in 1985 to 26 percent in 2019. This level is close to the average of OECD countries (32 percent) and suggests that decentralization in Latin America is reaching a mature stage. The relative increase of SNGs' spending has usually been coupled with an increase in the scope of functions and public services they deliver (Perez Benitez et al., 2022). At the same time, the severity and incidence of anomalous and adverse climate events in LAC have markedly increased as thoroughly documented in ECLAC (2015) and Cardenas et al. (2021).

Current service delivery responsibility assignments to SNGs do not sufficiently consider their relationship to climate change, even though SNGs tend to be the level of government closer to the population, and hence the first line of the public sector dealing with disruptions in service provision. This chapter analyzes some of the most common spending responsibilities of LAC governments along the two dimensions of climate change action: mitigation and adaptation as well as cross-cutting areas related to both.

Among the main competencies assigned to SNGs that can contribute to climate change mitigation are urban transport; infrastructure development; urban solid waste treatment; recycling and disposal; and water, sanitation and drainage, which are the focus of this paper.

Additionally, some countries enable their SNGs to regulate housing construction codes. Typical subnational functions related to adaptation include housing and urban planning, the provision of

resilient local public infrastructure, climate risk management, water and sanitation, as well as health. Meanwhile, competencies related to climate change, in general, are land use planning, housing and urban settlements, and water and sanitation provision. SNGs in LAC also have functions related to forestry management and protection. These activities tend to be linked to taxes, fees, or transfers from upper levels of government aimed at curbing externalities derived of economic activities and will be covered below in sections 2.2 and 2.3.

Table 1. Examples of Subnational Expenditure Assignments with an Incidence in Climate Change

Competence	Mitigation	Adaptation	Cross-cutting
Urban Public Transport	<ul style="list-style-type: none"> • Electromobility • Non-motorized transport • Low-carbon mass public transport 	<ul style="list-style-type: none"> • Construction of resilient road infrastructure 	
Treatment, recycling, and disposal of urban solid waste	<ul style="list-style-type: none"> • Elimination of open dumps • Carbon prevention, capture, and storage 	<ul style="list-style-type: none"> • Building/improving multipurpose reservoirs • Creating interconnected regional water systems and enhancing groundwater recharge • Increasing supply of water by improving technical efficiency 	Restore wetlands to absorb and filter floodwaters
Energy	<ul style="list-style-type: none"> • Electricity generation and distributed systems from renewable sources • Energy efficiency 		
Local public infrastructure	<ul style="list-style-type: none"> • Low-carbon local infrastructure 	<ul style="list-style-type: none"> • Coastal protection • Construction of slopes • Increasing permeable surfaces and wetlands to increase natural infiltration of rainwater and reduce stormwater runoff 	<ul style="list-style-type: none"> • Green infrastructure

Competence	Mitigation	Adaptation	Cross-cutting
Climate disaster risk management		<ul style="list-style-type: none"> • Understanding risk • Risk reduction • Disaster response • Recovery from climate events 	
Water and sanitation services			<ul style="list-style-type: none"> • Conservation and recovery of water sources. • Construction of reservoirs
Environmental protection			<ul style="list-style-type: none"> • Restoration and reforestation • Conservation of protected areas, and prevention of deforestation

Source: Authors, based on (Smoke & Cook, 2022)

2.1.1 Expenditure assignments with incidence in mitigation

This section discusses specific examples of actions taken by LAC SNGs on mitigation in the areas of urban public transportation, solid waste management, and energy. Climate change mitigation refers to “human intervention to reduce the sources or enhance the sinks of greenhouse gases” (Edenhofer et al., 2014). Governments can contribute to mitigation either through regulatory action (for instance, mandating adoption of certain standards and technologies), spending (for instance, building infrastructure that reduces CO₂ emissions), or taxation (for instance, by imposing a tax on fuel).

Urban public transportation

Globally, the transportation sector is considered the second largest source of CO₂ emissions (International Energy Agency, 2022). At a conceptual level, SNGs can have incidence on transportation through four channels: regulation, infrastructure, direct provision, and taxation of

urban toll roads or vehicles. This section focuses on examples of actions taken by LAC SNGs on the construction of urban public transportation. Urban public transport in the region is a shared responsibility between central and subnational levels in nine countries (Argentina, Brazil, Colombia, Ecuador, Mexico, Nicaragua, Paraguay, Peru, and Venezuela). In four countries it is an exclusive competence of local governments (Chile, Guatemala, Honduras, and Panama); in Uruguay, it is an exclusive assignment of intermediate governments,⁵ and it is an exclusive responsibility of central governments in three countries (Bolivia, Costa Rica, and El Salvador).⁶ SNGs in Argentina, Brazil, Chile, Colombia, Costa Rica, Mexico, and Peru have conducted important initiatives to reduce carbon emissions of urban transportation. All these initiatives were focused on intermodal integration that includes bicycles, urban electromobility, or by fostering the use of low-emission vehicles.

Table 2. Examples of Low-Carbon Urban Public Transport Subnational Initiatives in the LAC Region

Country	City	Initiatives	Source
Argentina	Santa Fe	Implementation of an integrated mobility system, identifying possibilities for river public transport and the intermodal integration of buses and bicycles.	(CAF, 2020)
Brazil	Niterói, Porto Alegre, João Pessoa, Campinas, Joinville, Salvador, São Paulo and the Federal District.	Implementation of the “Complete Streets Project” to develop low-carbon mobility and promote the use of bicycles.	Programa Internacional de Cooperación Urbana Unión Europea-América Latina y el Caribe (IUC), 2020

⁵ Uruguay’s intermediate governments (*departamentos*) tend to have functions that are similar to those of local governments in other countries. See Martínez-Vázquez et al. (2019), and Pérez Benitez et al. (2022) for a full analysis of the functions of Uruguayan *departamentos*.

⁶ Annex 1

Country	City	Initiatives	Source
	Fortaleza	Electric car-sharing network in the Alternative Vehicles for Mobility Project (VAMO) where each shared car replaces the use of at least 6 private cars combining intermodal integration.	IUC, 2020
Colombia	Bogota	Positioning the bicycle as the center of mobility policy; it has about 60 kilometers of bike paths to decongest the TransMilenio bus system.	(CAF, 2020)
	Medellin	Integrated Transportation System (Metro, Cables, Tram, buses, and a public bicycle system.)	(CAF, 2020)
Costa Rica	Belén, Curridabat, Desamparados, Escazú, Oca, Mora, La Unión, San José	Cooperation Agreement for the Intercantonal Active Mobility Network among municipalities promoting bicycle use, pedestrianization of streets and promotion of low-carbon transport alternatives.	(Belén, 2021)
Mexico	Guadalajara Metropolitan Area	Within the framework of its Climate Action Plan, it has expanded the public bicycle system. In July 2021, the first 100% electric public transport route in the metropolitan area began operations.	(GCoM, 2021)
Chile	Santiago	Downtown Plan, which is part of the Comprehensive Mobility Plan of the Municipality of Santiago, including sustainable mobility measures such as Pedestrians First and Pro Bicycle.	IUC, 2020

Country	City	Initiatives	Source
		Green Zone for Transportation in Santiago that seeks to reduce emissions in transportation. It contemplates the promotion of zero and low-emission vehicles; clean and energy efficient public transport buses; promotion of non-motorized vehicles use.	IUC, 2020
Peru	Lima	Different initiatives have been implemented within the framework of the Sustainable Urban Mobility Policy (2016), such as: creation of a bicycle loan system, improvement of public transport, restriction of heavy transport in centralities, creation of the Pact for Sustainable Urban Mobility, among others.	IUC, 2020
		The patrolling and citizen security services use zero-emission electric motorcycles.	IUC, 2020

Source: Authors, based on desk review of each country and (Global Climate Action, 2022)

Solid waste management

The final disposal of solid urban waste contributes to 3 percent of GHG emissions globally. Solid waste management involves a series of stages that include generation, transportation and collection, classification, reuse, storage, treatment, recycling, and final disposal. Among these stages, the ones that have an impact on climate change are classification, treatment, recycling, and final disposal. Another inappropriate practice is the open burning of solid waste. Leaving solid waste in open dumps generates GHG emissions, especially methane, which have a greater impact on climate change than carbon dioxide. However, if the SNGs adopt technologies that

allow gas recovery, recycling, and composting, among other good practices, they can significantly contribute to mitigation.

At the same time, solid waste management has an adaptation dimension, as the infrastructure required to handle waste needs to morph into more efficient and larger facilities. Although waste collection and management systems have improved in recent decades, it is estimated that worldwide around one third of the waste generated ends up in open dumps and 90 percent of the waste is not used or recovered.⁷

In most LA countries, the responsibility for solid waste management has been assigned to the local level, whereas in Argentina⁸ and Uruguay⁹ it corresponds to the intermediate level of government. Likewise, this competence is concurrent in Bolivia (central, intermediate, and local) and Venezuela (central and local).

SNGs in Brazil, Colombia, and Chile have implemented relevant initiatives to reduce GHG emissions in waste management. They include separating and treating biodegradable municipal waste and converting it into compost or bioenergy, and collecting, capturing, and using landfill gas, among others.

⁷ (Onu Medio Ambiente, 2018)

⁸ In Argentina, it was assigned to the provinces and the City of Buenos Aires:
<https://www.argentina.gob.ar/normativa/nacional/ley-25916-98327/texto>

⁹ Intermediate governments in Uruguay have similar functions as a local government.

Table 3. Examples of Low-Carbon Waste Management Initiatives

Country	City	Initiatives	Source
Brazil	Curitiba	"Garbage that is not garbage" program, which achieved 100% coverage with selective solid waste collection services for recycling.	(Torres, 2021)
Colombia	Bogotá	Circular economy model with the creation of new land for the separation and use of organic, construction and demolition waste.	Bogotá, 2022
Chile	Santiago de Chile	Santiago Recicla Program that includes a training program on waste management and recovery; the construction of a network of clean points; and segregated collection of recoverable household waste "house to house".	Santiago Recicla, 2020
	Viña del Mar	Reuse and recycle urban waste program, as well as a waste NAMA.	Climate and Clean Air Coalition

Energy

Power generation is the main contributor to GHG emissions. At the same time, it is one of the sectors where significant cuts can be achieved using renewable energies and improved energy efficiency, among others.¹⁰

SNGs can play a relevant role in the reduction of energy emissions. Around 97 percent of the population in the LAC region has access to electricity. Though power generation and transmission tend to be responsibilities of central governments, distribution of public electricity is a local government responsibility in most LAC countries (see Perez Benitez et al., 2022)¹¹

¹⁰ (University of Cambridge and World Energy Council, 2014)

¹¹ The value chain of the electric power sector involves generation, transmission, distribution and commercialization and its responsibilities are managed concurrently at different levels of government. Although there is heterogeneity among countries, electricity generation and transmission are an exclusive responsibility of the central level, while distribution and commercialization are more often the competence of SNGs and the private sector.

leaving ample room for investment in energy efficiency. Other measures that SNGs can take to contribute to the reduction of GHG emissions in the power sector include making their own buildings energy efficient.

Overall, the scope of SNG involvement in mitigating energy emissions depends on a number of regulatory and technical factors. On the regulatory front, opening green power generation to local governments or enabling them to support self-distributed generation can push them to contribute to climate change mitigation. The regulatory frameworks of some countries are already moving in this direction. At the generation level, there are major differences in the energy matrix of countries, but there is still a strong dependence on thermoelectric (fossil fuel dependent) generation. However, there are some efforts to increase the participation of hydroelectric generation and renewable energies.¹² In the region, a quarter of primary energy comes from renewable sources, mainly hydroelectric, contributing to the transition to a low-carbon economy.¹³ Unfortunately, the uncertainty about water precipitation associated with climate change means that the region will need to diversify its renewable resources, for example with solar and wind power generation.¹⁴

The actions developed by local governments include self-distributed generation of energy to meet the demand of their own buildings and vehicles; support the implementation of energy projects;¹⁵ and the renewal of infrastructure to provide energy-efficient public lighting.

¹² (CEPAL, 2019)

¹³ (IBD, 2020)

¹⁴ (IBRD - IDA, 2017)

¹⁵ (CDP & KAS, 2021)

Table 4. Examples of Initiatives to Transition to the Use of Renewable Energy Sources in GSN

Country	City	Initiative	Source
Argentina	Avellaneda Rosario La Plata	Roadmap to 100% renewable energy.	(CEPAL, 2020)
		Avellaneda incorporates intelligent lighting and cooling devices that reduce energy consumption through the Local Energy Efficiency Program in Public Buildings.	(CDP & KAS, 2021)
Brazil	Juazeiro	Installation of 9,144 solar modules on the roofs of 1,000 housing units in Morada do Rodeadouro and Praia do Salitre.	IUC, 2020
	Buenos Aires	Sustainable Public Building with international LEED Gold certification.	IUC, 2020
Peru	Arequipa	Installation of Solar Powered Street Lighting System.	IUC, 2020
	Huancayo	Solar water heaters to provide hot water to senior citizens.	IUC, 2020

2.1.2 Expenditure assignments with incidence in climate change adaptation

Extreme weather events cause draughts, storms, floods, and landslides that damage or destroy roads and bridges, and disrupt public services, leading to high repair costs. The consequences of extreme climate events tend to be more focused on the territorial or regional level and there are few cases in which they have externalities that affect other jurisdictions. However, in some cases the costs that may be involved in emergency and recovery could require compensation measures from the central government.

Therefore, applying the principle of subsidiarity, the allocation of competences related to adaptation policies should be focused on the subnational authority, such as those related to the construction of more resilient infrastructure, avoid disaster-prone areas, and improve disaster risk

management. Meanwhile, those related to emergency response and recovery from climate disasters should be concurrent (Martinez-Vazquez, 2021).

In 2020, 274 of 293 municipalities participating in the CDP-ICLEI Unified Reporting Platform reported at least one climate risk. Among others, storms (30 percent), floods (16 percent), extreme heat (14 percent), and water scarcity and droughts (13 percent)¹⁶ were the imminent risks identified by those municipalities.

Local public infrastructure

Adapting to climate change includes investing in resilient infrastructure. SNGs in LAC have allocated on average 1.5 percent of GDP to capital expenditures during 2015 to 2019,¹⁷ which compares to 3 percent in OECD countries. Capital expenditures are used for the construction of public infrastructure facing increasingly frequent and extreme weather events, causing losses and the need for more economic resources for their reconstruction. Moreover, the impact of climate change increases the costs of maintaining existing infrastructure. In many cases this leads to losses of public infrastructure with the consequent need to invest in its reconstruction; and imposes challenges to invest in new and more resilient infrastructure.

Comparatively low investment levels and climate change impose challenges to have more resilient local public infrastructure. Some available options to increase the resilience of local public infrastructure include reinforcing existing and new infrastructure, as well as considering ecosystem-based options.

¹⁶ (CDP & KAS, 2021)

¹⁷ ECLAC-IADB (forthcoming).

In this context, green infrastructure, such as urban forests, bike lanes, pedestrian infrastructure, water storage (water supply and flood control), among others,¹⁸ provide cost-effective solutions to address climate changes challenges. Table 5 presents examples of green subnational investment in the LAC region.

Table 5. Examples of Green Subnational Investment

Country	SNG	Initiative	Source
Argentina	City of Buenos Aires	Green infrastructures to increase drainage capacity towards Río de la Plata. The project integrates green infrastructure such as urban green corridors.	World Bank, 2019
Brazil	State of Espirito Santo	The state implemented green infrastructure targeting watersheds to restore and protect upstream forests.	(World Bank and World Resources Institute, 2019)
	State of Rio Grande del Sur	Project to recover 12 km of dunes where walkways were built to facilitate access to the beach.	(BID, 2020)
Mexico	Puerto Morelos	Artificial reefs were built to reduce wave energy and allow sand to accumulate on the beach.	
Argentina	Province of Buenos Aires	Construction and maintenance of infrastructure to canalize rivers and protect the population from floods	BID, 2017

Climate risk management

Climate risk management includes all activities aimed at addressing the following priorities established in the Sendai Framework for Disaster Reduction. The Sendai Framework describes concrete actions that governments can take to protect development gains from the risk of

¹⁸ (IDB, 2019)

disasters in the areas of strengthening governance; risk identification and awareness; risk reduction; emergency response and disaster recovery.¹⁹

However, SNGs have limited powers and capacities to undertake disaster risk reduction. SNGs can develop strategic plans that may include concepts of resilience, followed by responsibilities to develop urban risk plans and disaster management plans. Local governments share their functions with other public institutions for post-disaster recovery and reconstruction (UNISDR, 2017).

Even though central governments in LAC guide disaster coordination, progress has been made in recognizing the need for disaster reduction strategies at the subnational level. According to the Regional Observatory of Planning for Development in LAC, 12 of the 26 countries in the region have national disaster risk reduction plans or strategies, while SNGs of 9 countries (Argentina, Brazil, Chile, Colombia, Costa Rica, Ecuador, Mexico, Peru and Uruguay) have such strategies (CEPAL, 2021).²⁰ Some examples at the subnational level are Buenos Aires and Santa Fe in Argentina; Salvador de Bahía, Río de Janeiro and Porto Alegre in Brazil; Cali and Medellín in Colombia; Guayaquil and Quito in Ecuador; Colima, Guadalajara and Mexico City in Mexico; Montevideo in Uruguay; Santiago de Chile and Panama City.²¹

Many SNGs have the responsibility of addressing emergency response and disaster recovery. For example, Mexican SNGs are primarily responsible for offering post-disaster support to affected populations and for the recovery of damaged subnational public infrastructure. In the case of Colombian SNGs, when a natural disaster occurs, municipalities, followed by departments, are

¹⁹ (UNDRR, 2015)

²⁰ *Observatorio Regional de Planificación para el Desarrollo* is an initiative created by ECLAC aimed at analyzing and benchmarking national development plans.

²¹ <https://resilientcitiesnetwork.org/programs/the-resilient-community-impact-fund/>

the first to respond and provide the necessary financial resources. If their financial capacity is exceeded, central government assistance is provided.²²

Finally, the use of insurance by SNGs to cover damages to public infrastructure has been limited in LAC countries. For instance, by 2011, only 5 of 31 States of Mexico (Chiapas, Guerrero, Hidalgo, Jalisco and Veracruz) had purchased any insurance policy against climate disaster.

Local governments in the Caribbean tend to have staff-intensive functions and budgets. As a result, their role in the prevention of disasters linked to climate change is mostly related to the creation of awareness among the population. They work jointly with national governments in the management of natural disaster relief and response. In Bahamas, for example, local governments have a role in the management of standards of boats, therefore having incidence in the control of pollution of the seas.

2.1.3 Cross-cutting climate change expenditure assignments

There are several SNG competencies with an impact on both climate change mitigation and adaptation, such as the provision of water and sanitation services, and environmental protection.

The provision of water and sanitation services

Water management tends to be a concurrent responsibility in LAC, with some SNGs being responsible of water and sanitation management at the local level. In the countries where water and sanitation are a local government responsibility, a utility is commonly in charge of providing the service. The existence of water utilities creates its own series of challenges, such as their own financial health.

²² (OECD & The World Bank, 2019)

Water resources management tends to be a responsibility of the central government. Availability of Water resources in LAC depend on long-term storage in glaciers and dams, seasonal meltwater, and precipitation, among other. The progressive loss of storage in glaciers due to climate change will have a strong impact on water availability, especially during the dry season and that is already the case for Mexico City, which suffers from water insecurity and regular water shortages (Sandoval, 2021).

For this reason, SNGs must invest in water supply and sanitation systems that are resilient to the effects of climate change. Capital expenditures to adapt to climate change can come from national transfers or from the revenues generated by municipalities (or their utilities), in addition of credit financing that is in line with the medium-term sustainability of SNGs. Adapting water utilities to climate change requires balancing equitable access to water and sanitation services, long-term planning, and healthy revenue collection from water and sanitation services.

Environmental protection

The environmental protection function includes activities to foster the prevention, reduction, and elimination of pollution, as well as any other environmental degradation related to air protection, wastewater management, and biodiversity protection, among others. Many of the environmental protection activities have an impact on climate change mitigation and adaptation.

In all LAC countries, environmental protection is a competence exercised concurrently by various levels of government (Annex 3). The issuance of environmental protection policies is in general a responsibility of the central government, while SNGs can issue secondary regulations related to forest management, water, and soil conservation, and can implement additional environmental measures and actions within their jurisdictions.

2.2 Subnational level climate-related revenue generating tax powers

“Environmental/Green taxes are those whose tax base is a physical unit or proxy of something that has a proven negative impact on the environment” (United Nations, 2016, p. 125).

Environmental taxes fall into four broad categories²³: Energy taxes (including carbon taxes); transportation taxes; pollution taxes; and taxes on resources extraction.

According to Martinez-Vazquez (2021), a good subnational Pigouvian tax is one that falls on goods and activities with large elastic responses so that the tax is effective in reducing the climate damaging activity. Determining the level of government in charge of imposing an environmental tax is complicated due to the role of externalities: there is always a risk that taxing a polluting economic activity in one locality will result in it being transferred to another locality. Therefore, it may be desirable that this type of tax is established at the level of intermediate SNGs or central governments.

SNGs in LAC tend to have few tax powers and low collection efficiency compared to their peers in OECD countries, which leads to issues related to vertical fiscal imbalances and limits the availability of resources for financing climate measures and actions. Likewise, there are few sources of own revenues with climate impact at the subnational level in the region.

However, within the scope of existing responsibilities, SNGs can levy transportation taxes, charged to the ownership/use of vehicles and their tax base is the purchase or disposal value. These types of taxes are assigned both at the intermediate and local government level (Argentina, Bolivia, Chile, Colombia, Mexico, and Uruguay, among others) and at the local level (Chile,

²³ (Eurostat, 2013, pág. 13)

Bolivia, and Peru, among others). In Colombia, local SNGs can establish a surcharge on gasoline for road maintenance.

Some SNGs apply taxes on energy, such as the tax on petroleum products in Argentina and the tax on the environmental impact of motor vehicles in Bolivia. The most recent example is the implementation of carbon taxes in two Mexican states:

- The State of Zacatecas approved in 2017 a tax on the Emission of Gases into the Atmosphere as part of a tax reform that introduced many ecological taxes (Environmental Remediation in the extraction of materials; on the emission of pollutants into the subsoil and waters; and on the deposit or storage of waste). The tax base is made up by tons of registered emissions and converted to a carbon dioxide equivalence (tCO₂), which is a fee of \$250 Mexican pesos per tCO₂e. Revenues are used for different purposes, including social programs and the creation of climate change funds.
- The State of Tamaulipas implements the ecological tax on polluting companies (2022). This tax will apply to the economic agents that monthly emit more than 25 tons of carbon dioxide at a rate of \$261 Mexican pesos per ton.
- The States of Nuevo Leon and Jalisco have presented initiatives to their state congresses to introduce environmental taxes for the emission of gases into the atmosphere.

However, the federal government of Mexico is suing these states in the supreme court to abolish these subnational carbon taxes.

Two taxes related to waste generation were implemented in 2005 in the city of Buenos Aires²⁴:

- The tax on the generation of non-recyclable wet urban solid waste, where the passive subject are the generators of waste in appreciable quantities (for example, restaurants and bars) and its tax-base is the amount of wet solid waste generated in average daily liters.
- The tax on the generation of non-reusable aggregate and the generation of aggregated waste, demolition, and construction debris in general, where the tax-base is measured in square meters.

²⁴ <http://www2.cedom.gob.ar/es/legislacion/normas/codigos/fiscal/index7.html>

Table 6. Examples of Subnational Green Taxation in LAC

Type	Intermediate Government	Local Government
Energy	<p>Argentina: Tax on petroleum-derived fuels</p> <p>Mexico: Carbon tax in the State of Tamaulipas (2020) and in Zacatecas (2017); under review in Jalisco and Leon</p>	<p>Bolivia: Impact of motor vehicles on the environment</p>
Transportation	<p>Argentina: Tax on motor vehicles</p> <p>Brazil: Tax on the Ownership of Motor Vehicles</p> <p>Bolivia: Tax on the ownership of motor vehicles</p> <p>Colombia: Tax on motor vehicles</p> <p>Mexico: Tax on ownership of motor vehicles</p>	<p>Argentina: Motor Vehicle Patents</p> <p>Chile: Tax on motor vehicles</p> <p>Bolivia: Property tax on land motor vehicles</p> <p>Ecuador: Vehicle registration</p> <p>Peru: Motor vehicle patrimony</p> <p>Nicaragua: Road tax</p> <p>Paraguay: Vehicle registration</p> <p>Venezuela: Vehicle registration</p>
Pollution	<p>Argentina: Tax on the generation of non-recyclable wet solid urban waste. Tax on the generation of non-reusable aggregate and related waste</p> <p>Bolivia: Environmental affectation, except motor vehicles, hydrocarbons and mining</p> <p>Mexico: States may levy environmental taxes</p>	
Resource extraction	<p>Argentina: Irrigation fee, tax on forestry products, mineral exploitation royalties</p> <p>Mexico: Ecological taxes on mineral extraction²⁵</p>	<p>Honduras: Resource extraction and exploitation tax</p>

Besides, most SNGs charge tariffs or fees for the provision of public services related to climate-related competencies, such as fees for the use of drinking water, solid waste, or public lighting. The general rationale behind these fees is cost recovery, particularly in water supply. Relatedly, environmental fees are charged for environmental services rendered and are generally intended to finance operating costs and investment in environmental management, such as the

²⁵ <https://lucsdelsiglo.com/2020/06/21/da-zacatecas-pauta-a-impuestos-ecologicos-estados/>

conservation of forest reserves or the restoration of ecosystem services. Some relevant examples in the LA region are:

- Quito Water and Sewage Enterprise allocates 2 percent of the amount collected monthly for sewage and drinking water services to the Environmental Trust Fund for the Protection of Quito's Water for the conservation and protection of the aquifers surrounding the city of Quito²⁶.
- A Brazilian federal law established a dedicated fee that water users must pay to the local water company, then the funds are transferred to local watershed committees for reinvestment in watershed maintenance and reforestation. Some of these committees have decided to invest in reforestation.²⁷
- Local governments in Colombia may establish surcharges on real estate property taxes (15 to 25.9 percent), a percentage of which is earmarked for environmental and renewable natural resource conservation.

Another important non-tax instrument to reduce emissions associated with motorized travel is road user tolls and congestion charging. Tolls are road user charges designed to generate revenue for investment recovery and maintenance, as better maintained roads lead to lower GHG emissions. They can also serve to manage congestion. Congestion charges or access fees to restricted areas seek to reduce the number of vehicles during peak hours and encourage the use of other types of transportation, such as public or non-motorized. Despite the potential benefits of congestion charges or access fees to restricted areas, their adoption in LAC countries is null, and even at the global level their application is limited (examples include London, Stockholm, Singapore, Oslo, among others). The applicability of a congestion charge has begun to be studied in Mexico City, Santiago de Chile, and Bogota.²⁸

Finally, in Argentina we can find the only experience in the region with respect to subnational taxation of the rents from the use of non-renewable natural resources. The Constitution

²⁶ Ordenanza Metropolitana No 0199, marzo 2007

²⁷ (World Bank and World Resources Institute, 2019)

²⁸ (BID, 2021)

establishes that the provinces are the original owners of the natural resources located in their territories and therefore can sign contracts and have the right to collect royalties on oil and gas extraction.²⁹

2.3 *Intergovernmental transfer systems related to climate change*

Given their limited revenue autonomy or taxing powers, SNGs in LAC suffer from vertical imbalances and have a high dependence on central government transfers, which in 2019 accounted on average for 56 percent of their total revenue, equivalent to 4.9 percent of GDP.³⁰ Current intergovernmental transfer systems in LAC are based on revenue-sharing of central government revenues and have not been explicitly designed to close either vertical or horizontal gaps. In general, formulas that include variables related to population, territorial size and poverty indexes are used for distribution among SNGs. Regarding the use of these transfers, in some countries they are freely decided by SNGs and in other cases, they are conditioned for a specific purpose.

Over the last years, some transfers have been used as a mechanism to address large-scale environmental challenges, such as climate change adaptation and mitigation, biodiversity loss, and the degradation of ecosystems. Broadly, green/ecological fiscal transfers (EFT) can be divided in two groups: transfers to compensate SNGs for the exploitation of a natural resource within their demarcation; this kind of transfers can then be earmarked to the regeneration of ecosystems or to foster investment or can be non-earmarked. The second type of transfers is earmarked to the preservation of ecosystems and are allocated according to the functions granted to SNGs.³¹ This section will focus mostly on natural resource-based transfers.

²⁹ (Brosio, Jiménez, & Ruelas, 2018)

³⁰ ECLAC – IADB (2022).

³¹ (Busch & others, 2021)

For example, Brazil's federal constitution authorizes Brazilian states to levy a value-added tax (Tax on Commerce and Services- ICMS), and 18 of the 27 Brazilian states have adopted the ICMS with a revenue sharing mechanism where 75 percent is retained by the state government, while the remaining 25 percent must be devolved to municipal governments. Each state may determine the formula by which 25 percent is distributed according to the percentage of preserved land that the municipality sets aside, rewarding the states that ensure a balance between public infrastructure and environment.³² As of 2020, several ecological indicators have been included in the ICMS formula: land area under protection (15 states), indigenous land (11 states) and basic sanitation including waste management, wastewater, and water treatment (7 states). Other ecological indicators include forest areas in Minas Gerais, deforestation reduction in Pará, fire control in Tocantins, and areas flooded by dams in Rio Grande do Sul. The share of municipal ICMS revenue based on these ecological indicators varies from 1 percent in São Paulo state to 20 percent in Acre.³³

Few intergovernmental transfer systems have any relation to climate change. The only thing that can be highlighted are few cases where there is a specific destination or earmarking for environmental protection, such as:

- Nicaragua established that at least 5 percent of the total investment transfers received by the municipalities must be earmarked for the environment and 7.5 percent for water and sanitation.³⁴
- In Bolivia, the resources collected from patents for the use of forest resources are distributed among prefectures and municipalities in which jurisdictions harvesting areas

³² (IMF, 2021)

³³ (Busch & others, 2021)

³⁴ <http://www.amunic.org/wp-content/uploads/2015/08/Ley-466-Ley-de-Transferencias-Presupuestarias-a-los-Municipios-de-Nicaragua.pdf>

are located, in order to support and promote the sustainable use of forest resources, among others.³⁵

On the other hand, transfers from non-renewable natural resources (NRNR), which are prevalent in Andean countries, have as economic justification the compensation to SNGs from where the resources are extracted, due to the negative environmental and social externalities caused by extractive industries.³⁶ Except for Chile and Venezuela (where the resource remains centralized), in most LA countries where NRNRs are exploited, they are collected centrally, and devolutionary transfers to SNGs have been established based on co-participation systems on the revenues generated by taxes on these activities, royalties, fees, among others. Furthermore, these distribution systems have been characterized as asymmetrical, i.e., in a few cases, such as Paraguay, resources are distributed to all SNGs (although they are based on hydroelectric royalties, a renewable resource); but in most cases, resources are only distributed to the SNGs where NRNR exploitation takes place or there are mixed systems implemented. For example, regarding royalties in Brazil or royalties and corporate income tax in Peru, a part of those is allocated exclusively to the producing areas, causing in many cases issues of horizontal imbalances among SNGs (Brosio, Jiménez, & Ruelas, 2018). In Bolivia, Colombia and Ecuador, systems for sharing these rents in favor of all SNGs have been established.

In Colombia, the General Royalties System was established as a mechanism for the distribution of NRNR to finance projects for social, economic and environmental development in the territorial entities where these resources are exploited.³⁷ All SGR resources will finance investment projects submitted by the territorial entities to the Collegiate Administration and

³⁵ Art. 38, Forestry Law Law 1700, July 12, 1996, available at <http://extwprlegs1.fao.org/docs/pdf/bol6960.pdf>

³⁶ Bahl and Tumennasan (2002).

³⁷ Legislative Act 05, 2011

Decision-Making Bodies, which are in charge of evaluating and prioritizing them, where the Ministry of Environment and Sustainable Development is a permanent member.³⁸ Regarding the distribution of royalties related to environmental impact, it is established that (SGR, 2021):

- 15 percent must be allocated for local investment by municipalities in Environment and Sustainable Development: at least 2 percent of the Local Allocation will be destined to projects related to environmental and sustainable development impact.
- 1 percent for the conservation of strategic environmental areas and the fight against deforestation, which have a direct impact on the conservation of carbon stocks and contribute to climate change mitigation.

In Ecuador, the (Organic Law for the Integral Planning of the Amazon Special Territorial District, 2018) establishes that the Amazon Sustainable Development Fund will be financed with 4 percent of the sale price for each barrel of oil extracted from the district (at least USD 2 per barrel); and establishes that SNGs must prioritize investments for environmental remediation, among others.

In Peru, SNGs are allocated 50 percent of income tax revenues from mining and oil companies and 100 percent of royalties, which must be used mainly for public investment in general, with no earmarks to compensate for the environmental and social impact of these industries. In addition, there is the Forestry Canon, which is the participation of the districts in the payment of the rights to harvest forest and wildlife products, as well as permits and authorizations granted by the competent authority.³⁹

³⁸ Law 1530, May 17, 2012 and Law 2056, 2020

³⁹ https://www.mef.gob.pe/es/?option=com_content&language=es-ES&Itemid=100848&view=article&catid=150&id=2296&lang=es-ES

Table 7. Transfers of Non-Renewable Natural Resources with Environmental Incidence in LAC

Country	Non-renewable transfer	Distribution base	Level government Beneficiary	Environmental criteria or indicator	Specific environmental destination
Bolivia	Departmental Royalty	11% Departmental Production of Hydrocarbons	Departmental where production originates	No	No
	Compensatory Royalty for the Departments of Beni and Pando	1% of the national production of hydrocarbons controlled	Beni and Pando	No	No
	Mining royalties	100% of royalty	Departmental governments	No	No
	Hydrocarbon royalty		Departmental governments	No	No
	Direct Hydrocarbon Tax	IDH revenues	24% Departmental governments 25% municipalities	No	No
	Hydrocarbons Patents	Revenue collection	50% municipalities	No	No
	Mining Patents	Revenue collection	30% municipalities	No	No
Colombia	General Royalties System	Royalties collected	20% for SNGs where RNNR exploitation is carried out and municipalities with marine and river ports where these resources are transported. Additional 5% for municipalities where NRRR are exploited.	No	15% for allocation for local investment in environment and sustainable development with a minimum of 2% destined to projects with an impact on the environment and sustainable development. 1% for the conservation of strategic environmental areas and the fight against deforestation.
Ecuador	Territorial equity model ⁴⁰	10% of non-permanent revenues (oil and mining)	All SNGs	No	No
	Organic Law of the Special Amazonian Territorial Circumscription	Amazon Sustainable Development Fund: 4% of the sale price for each barrel of oil extracted. The allocation will not be less than USD 2 per barrel. Common Fund for the Amazon Special Territorial District: 60% of mining royalties, 17% of mining profits, 12% of hydrocarbon activity profits, among others generated in that territory.	GSN in the Amazon region	No	Amazon Sustainable Development Fund: Environmental Management and Remediation. Common Fund for CTEA: No
Mexico	Hydrocarbon participations	Different Royalties derived from the exploitation of hydrocarbons go to states and munis where oil is extracted. Though they are not earmarked, they sometimes go to cover externalities		No	No

⁴⁰ (Ley Orgánica para la Planificación Integral de la Circunscripción Territorial Especial Amazónica, 2018)

Country	Non-renewable transfer	Distribution base	Level government Beneficiary	Environmental criteria or indicator	Specific environmental destination
Peru	Mining Royalty, Hydro energy Royalty, Gas Royalty	50% of the income tax revenues of mining and oil companies and 100% of royalties.	GSN in the area of influence where the resource is exploited.	No	No
	Forestry Fee	50% of the payment of the right to harvest forest and wildlife products, as well as the permits granted. ⁴¹	SNGs in the area of influence where the resource is exploited.	No	No
	Socioeconomic Development Fund ⁴²	25% of the resources corresponding to the National Government of the royalties from Lots 88 and 56, after payment of the Gas Canon and other deductions corresponding to PERUPETRO S.A., OSINERG and the Ministry of Energy and Mines.	SNGs where the main pipelines containing hydrocarbons from Lots 88 and 56 are located.	No	Investment projects, including environmental and ecological preservation.

2.4 Access to climate finance at the subnational level

Huge funding resources need to be deployed to support SNGs to build resilient, low-emission or green infrastructure; and to cope with emergencies and recovery from climate disasters. SNGs access to subnational financing is limited due to several factors, ranging from underdevelopment of capital markets to prudential subnational fiscal discipline frameworks implemented after episodes of financial distress and bailouts by national governments.

The ability of SNGs to obtain green financing depends on the national financial markets' frameworks, ranging from the taxonomy to define what green financing is (Eguino, 2020), to the ability to contract financing. Examples of green bond issuances in the region include:

- The province of Jujuy in Argentina went to the markets in 2017 to raise USD 210 million in green bonds to partially finance the Puna-Cauchari Solar Project.
- The province of La Rioja in Argentina in 2017 placed USD 200 million to finance the expansion of the Arauco Wind Farm.⁴³

⁴¹ www.mef.gob.pe/es/?option=com_content&language=es-ES&Itemid=100848&view=article&catid=150&id=1547&lang=es-ES

⁴² www.mef.gob.pe/es/?option=com_content&language=es-ES&Itemid=100848&view=article&catid=150&id=2303&lang=es-ES

⁴³ riojavirtual.com.ar/la-toma-del-bono-verde-riojano-premiado-a-nivel-internacional/

- Mexico City has issued two such bonds for USD 49.3 million (2016) and USD 112.6 million (2017) that included categories related to water (flood mitigation), energy efficiency and clean transportation, among others.⁴⁴

We note that other projects that could qualify as green are not currently classified as such due to the lack of a national taxonomy on what constitutes green financing.

Given the history of subnational financing in the region, coordination with the national government will be essential to manage green subnational financing. Colombia's National Planning Department (DNP) has pioneered the development of a Climate Finance Measurement, Reporting and Verification (MRV) System. The Climate Finance MRV System is defined as a set of information management processes for monitoring and reporting flows of public domestic, public international and private climate financing in Colombia. DNP leverages the existing Unique Form for Territorial Information System,⁴⁵ which was originally designed to monitor subnational fiscal and financial flows.

Multilateral development institutions can contribute to the funding of green projects in countries where regulations allow. In 2020, the Green Climate Fund (GCF) approved the Global Subnational Climate Fund for USD 750 million (with USD 150 million from the GCF plus co-financing). This fund seeks to catalyze climate investment at the subnational level for mitigation and adaptation solutions by helping to overcome barriers to attract private investment. This fund is expected to benefit 42 countries worldwide, including Bahamas, Brazil, Chile, Costa Rica, Dominican Republic, Ecuador, El Salvador, Guatemala, Haiti, Honduras, Jamaica, Mexico, Panama, and Uruguay.⁴⁶

⁴⁴ www.greenbondtransparency.com/issuer-profile/?handle=41a17d74786c4652b5af2302192dc159

⁴⁵ mr.v.dnp.gov.co/Paginas/inicio.aspx

⁴⁶ www.greenclimate.fund/project/fp152

3 What policies and instruments of administrative decentralization support the development and implementation of the SNGs climate actions?

In addition of spending, taxation, and green financing, SNGs can have an incidence on climate change adaptation and mitigation through administrative regulatory, operational, informational, and analytical actions, as well as collaborative governance (Smoke & Cook, 2022).

Table 8. Subnational Administrative Functions with Incidence in Climate Change and Examples of Climate Measure and Actions

Administrative Functions	Mitigation	Adaptation	Cross-cutting
Regulatory	<ul style="list-style-type: none"> Emission standards Energy efficiency standards Implementation and climate regulation enforcement 		<ul style="list-style-type: none"> Zoning and land use Building codes
Operational	<ul style="list-style-type: none"> Green subnational public procurement 	<ul style="list-style-type: none"> Screening for climate risks in public investment methodologies Applying shadow carbon price on the projects Climate risk mitigation measures 	<ul style="list-style-type: none"> Sustainable development planning Subnational climate tagging
Information and Analytics	<ul style="list-style-type: none"> GHG emissions inventory 	<ul style="list-style-type: none"> Collecting and analyzing multidimensional climate vulnerability data 	
Collaborative Governance			<ul style="list-style-type: none"> Intergovernmental coordination Multi-actor partnerships Community engagement in climate adaptation decisions

Source: Authors, based on (Smoke & Cook, 2022)

3.1 Subnational regulatory frameworks and climate change

SNGs can regulate zoning and land use to prevent or limit human settlements in areas with high risks of landslides, river overflows, among others. They can also regulate the resettlement of populations in places with lower risk of climatic events. Similarly, SNGs can also develop and enforce the use of building codes according to specific land-uses, which can include provisions or incentives to increase their capacity to adapt to climate change and be more sustainable.

In the same vein, some SNGs in the LAC region have issued energy saving policies or have established emission standards for electric companies or for buildings or residences. They have also begun to implement regulatory actions to accelerate the transition to renewable energy sources in order to contribute to the reduction of GHG emissions. In the next table, some examples of international commitments and regulations being made by SNGs in LAC with the aim of contributing to the decarbonization of electricity and the gradual reduction of fossil fuel use are presented.

Moreover, some SNGs in LAC have the power to regulate the levels of air pollutant emissions, including greenhouse gases, in their territorial scope. This regulation is mainly related to productive activities or emissions from the vehicle fleet in their locality. The type of regulations may include the establishment of rules and guidelines on certain economic activities, pollution levels considered admissible, establishment of maximum production levels, prohibition of certain products that potentially pollute the air, regulate, limit or discourage the use of vehicles in areas or at times of high congestion, and even implement sanctions in case of non-compliance.

Table 9. Examples of the Incorporation of Climate Change Management in Subnational Regulatory Frameworks in LAC

Country	City	Initiative	Source
Argentina	Rosario	Require all new and retrofitted public buildings under municipal management to use solar water heaters to heat at least 50% of the building water supply.	IUC, 2020
	San Carlos de Bariloche	Since 2016, the Sustainability Homes Program has been implemented, which seeks to improve thermal conditions and energy savings, among others.	IUC, 2020
	Resistencia	Municipal Environmental Code and Sustainable Neighborhood Environmental Certification.	IUC, 2020
Brazil	Juazeiro	The project promoted the installation of 9,144 solar modules on the roofs of approximately 1,000 housing units in the Morada do Rodeadouro and Praia do Salitre condominiums.	IUC, 2020
	Rio de Janeiro	To ensure that more than 14,000 homes were not in landslide risk zones in the Maciço da Tijuca area.	(CDP Latin America & KAS, 2021)
		Qualiverde Certification Program: Point system for certification covering different building systems; successful certification eligible for tax benefits.	(Smoke & Cook, 2022)
Chile	Maule Region	A zoning plan was implemented to reduce the vulnerability of the population and a green corridor was created between the dunes and the population. Also, building codes were modified to promote structures with greater resistance to flooding.	(BID, 2020)
Peru	Lima	Local regulations for the promotion of Green Buildings and programs for the promotion of green buildings and green roofs in the San Borja District.	IUC, 2020

3.2 *Subnational planning and land management functions with incidence on climate change*

The operational functions that SNGs can use to support mitigation and adaptation targets include measures and actions within planning and budgeting systems based on GHG emissions inventories and climate vulnerability assessments.⁴⁷

In most LAC countries, SNGs have been assigned the responsibility of planning and land management, either on a concurrent or an exclusive basis. These plans are related to mitigation actions since they regulate and encourage an orderly occupation and sustainable use of the territory's natural resources; for example: controlling the expansion of the agricultural frontier and thus limiting deforestation and preserving carbon stocks. On the other hand, territorial management is closely linked to adaptation since it limits or prohibits the location of human settlements/housing in areas with high risks of landslides, river overflows, among others.

Most of the countries in the region have established national strategies related to climate change at the national level,⁴⁸ but with limited progress at the subnational level.

Some SNGs have begun to evaluate, plan and implement adaptation plans. In the CDP & ICLEI Unified Reporting System of 293 participating cities, 171 cities (60 percent) in Latin America reported having a climate vulnerability study that analyzes the most vulnerable areas and populations; and 94 cities also in LAC (34 percent) reported having an Adaptation Plan.

⁴⁷ (Smoke & Cook, 2022)

⁴⁸ At least eight countries have begun to strengthen, coordinate and establish implementation plans (Paraguay and Ecuador), roadmaps (Honduras and Guatemala), action plans (Chile), tentative schedules (Peru), and national climate change plans and strategies (El Salvador and Colombia), which contribute to the process of NDC implementation (CEPAL, 2021, pág. 35).

Table 10: Examples of the Incorporation of Climate Change Management in Planning Instruments in LAC

Country	City	Initiative	Source
Argentina	Salta	Integral Plan for Environmental Urban Development	IUC, 2020
	Villa Carlos Paz	Protected mountains recover	IUC, 2020
Brazil	Río de Janeiro	Low Carbon Development Program.	IUC, 2020
	Fortaleza	Low Carbon Development Program.	IUC, 2020
	Sorocaba	Low Carbon Development Program.	IUC, 2020
Chile	Valdivia	Action Plan Valdivia Sustainable City.	IUC, 2020
Colombia	21 SNGs	Formulation of 21 Integrated Territorial Climate Change Management Plans. (PIFCCT)	(CEPAL, 2020)
	Monteria	Development Plan 2016 - 2019: Monteria Green and Smart City of Colombia.	IUC, 2020
Ecuador	Some SNGs	Implementation of guidelines and directives for updating Development and Land Management Plans in which conservation, climate change and sustainable production approaches were inserted.	Resolution No. STPE-022-2020, Technical Secretariat Planifica Ecuador
Paraguay	Asunción and others	Declaration of Interest of Municipalities of the Metropolitan Area of Asunción to face Climate Change and have a guide for Local Climate Change Adaptation Plans.	(CEPAL, 2020)
Peru	All	The Climate Change Framework Law creates an obligation for NSGs to include NDC mitigation and adaptation actions in their planning and budgeting.	(CEPAL, 2020)

Though several countries are making efforts to identify and classify their public climate expenditure in their national budgets (Costa Rica, Colombia, Chile, Ecuador, and El Salvador),

only the Mexican state of Guanajuato has carried out a similar initiative at the subnational level. Guanajuato now identifies budgetary programs with climate impact in its budget and reports them in an Annex in its budget proposal 2022 (Art. 35),⁴⁹ and their execution is presented in its budget transparency portal.⁵⁰

In Peru, the Ministry of Economy and Finance developed a website reporting expenses on climate change adaptation and mitigation within its overall Economic Transparency portal regarding. This consultation allows access to daily information on expenditures linked to climate change for the regional and local levels of government.⁵¹

Regarding initiatives related to public investment systems, many SNGs have public investment systems focused on project prioritization, which sometimes follow national guidelines.⁵²

However, the effectiveness of investment allocations is limited by a lack of climate information and bounded technical capacities. Some examples related to the incorporation of climate change in public investment systems are:

- Basic Regulations for Pre-investment of the Public Investment System in Bolivia, which is applicable to the entire public sector, establishing the analysis and design of disaster risk prevention, as well as management measures and adaptation to climate change must be carried out⁵³.
- During an emergency in Peru, central and SNGs must ensure that the necessary expenses are allocated in their budgets. Additionally, Law No. 30191 establishes measures to assist national and SNGs in preventing and mitigating disaster risk.
- In Costa Rica, public institutions are required to include allocated resources in their budgets for prevention and emergency preparedness actions under their jurisdictions.⁵⁴ Furthermore, they must use the Methodological Guide for Planning the Execution Stage

⁴⁹ finanzas.guanajuato.gob.mx/paquetefiscal2022/public/docs/P/PF/LyEM/LeyEgresos.pdf

⁵⁰ presupuestoabierto.guanajuato.gob.mx/#/enfoquesinteractivo-cc

⁵¹ www.mef.gob.pe/es/?option=com_content&language=es-ES&Itemid=100944&lang=es-ES&view=article&id=504

⁵² (Tejada & Zapata, 2019)

⁵³ archivo.vipfe.gob.bo//PR/documentos/normas/4_RM_115_RBP_2015.pdf

⁵⁴ Article 45 of Law 8488

of Public Investment Projects and the Methodology for risk analysis with a multi-hazard approach and probabilistic criteria in projects.⁵⁵

- In Guatemala, public investment entities must apply the Guide for Risk Analysis and Management in Public Investment Projects.⁵⁶
- The Municipal Guide for Disaster Risk Management in Panama establishes the obligation to include the "risk variable" in public investment projects.⁵⁷
- The Program for Development and Strengthening of Fiscal and Subnational Service Management in Uruguay supports intermediate governments to make investments related with adaptation or mitigation.⁵⁸

Finally, subnational public procurement processes will be able to promote the acquisition of low-carbon goods and services. Green public procurement (GPP) could be an important tool for changing sustainable production and consumption patterns, but also to generate important savings for the subnational budget. For example, in 2018 the Municipality of Mendoza (Argentina) introduced reforms that allowed procuring agencies to prioritize goods and services from triple-impact companies (Economy, society and nature).⁵⁹

3.3 *Information and analytics*

The implementation of the Paris Agreement nationally determined contributions or NDCs will benefit from the collection and use of climate change related information that can be generated by SNGs in relation to the measurement, reporting and verification (MRV) of GHG emissions. Moreover, GHG emissions inventories and climate vulnerability assessments can allow SNGs to take effective action in mitigating climate change, creating a strategy to reduce GHG emissions, prioritizing public investment and deciding spending allocations.

⁵⁵ documentos.mideplan.go.cr/share/s/i4gplwiCT6u1v_ZQ-rGtXg

⁵⁶

[snip.segeplan.gob.gt/sche\\$sinip/documentos/An%C3%A1lisis_de_Riesgo_en_Proyectos_de_Inversi%C3%B3n_P%C3%BAblica.pdf](https://snip.segeplan.gob.gt/sche$sinip/documentos/An%C3%A1lisis_de_Riesgo_en_Proyectos_de_Inversi%C3%B3n_P%C3%BAblica.pdf)

⁵⁷ www.sinaproc.gob.pa/wp-content/uploads/2020/05/Guia-Municipal-Panam%C3%A1.pdf

⁵⁸ www.iadb.org/en/project/UR-L1111

⁵⁹ (Organization of American States, 2020)

In most countries of the region, MRV systems are being developed at the central government level with a "top-down" approach, however, there are some initiatives from SNGs to have inventories based on the IPCC 2016 guidelines carried out with their own methodologies. Therefore, the data collected have inconsistencies and quality issues, causing troubles when making comparisons.

The Greenhouse Gas Protocol (GGP) is working to give cities the standards and tools to measure their emissions.⁶⁰ Twelve cities in the LAC region have reported their GHG inventories with the GGP's methodology (Bogota, Buenos Aires, Curitiba, Guadalajara, Lima, Medellin, Mexico City, Quito, Rio de Janeiro, Salvador de Bahia, Santiago of Chile, and São Paulo).⁶¹

Additionally, there are 284 SNGs in 13 LAC countries that reported their GHG inventory at the CDP-ICLEI Unified Reporting System, in 2020. The countries where the most SNGs have reported their GHG emission inventories are Argentina (71), Brazil (87), Colombia (31), Costa Rica (15), Mexico (36), and Peru (816), among others.⁶²

3.4 *Intergovernmental coordination for the implementation of climate actions*

The externalities caused by climate change normally exceed the territorial dimension of SNGs and are related to activities in different economic sectors. Managing climate change requires adequate intergovernmental and intersectoral coordination mechanisms to implement climate policies: for the establishment of emissions reduction commitments at the national level; the construction of inventories and monitoring of GHG emissions; as well as the generation of capacities and the exchange of experiences on subnational climate action.

⁶⁰ ghgprotocol.org/greenhouse-gas-protocol-accounting-reporting-standard-cities.

⁶¹ Annex 3.

⁶² data.cdp.net/Emissions/2020-City-Wide-Emissions/p43t-fbkj?msclkid=743a47c7ab2611eca28afaba42953dd

At least 14 countries in LAC have used NDCs development processes that include the participation of different levels of governments: Argentina, Brazil, Chile, Colombia, Costa Rica, Ecuador, El Salvador, Honduras, Mexico, Nicaragua, Panama, Paraguay, Peru, and Uruguay⁶³.

At least five LAC countries have created specific institutional mechanisms for the multilevel coordination of mitigation and adaptation actions: Colombia, Guatemala, Mexico, Paraguay, and Peru.⁶⁴ In institutionalizing these mechanisms and moving away from ad hoc mechanisms it is necessary to take the input of subnational governments into consideration when designing climate change related policies.

Table 11. Examples of Multilevel Coordination Initiatives in LAC

No.	Country	Multilevel Coordination Initiatives	Participation mechanism of coordination	Institutional mechanism of coordination
1	Argentina	Multilevel organizations, such as the Federal Council for the Environment of Argentina and the Argentinean Network of Municipalities in the face of Climate Change coordinate different local governments to promote work on climate change and establish GHG inventories at a provincial scale.	X	
2	Brazil	An evaluation of vulnerability to climate change at a municipal level was established through the Climate Vulnerability System.	X	
3	Chile	There are Regional Climate Change Committees and the Chilean Network of Municipalities for Climate Change that promotes climate work at a local level.	X	
4	Colombia	The National Climate Change System in Colombia is a system that allows for interinstitutional and multilevel coordination, integrating the various levels of government. This initiative	X	X

⁶³ (ECLAC, 2020)

⁶⁴ (ECLAC, 2020)

No.	Country	Multilevel Coordination Initiatives	Participation mechanism of coordination	Institutional mechanism of coordination
		represents an experience with NDC monitoring, reporting and verification ⁶⁵ .		
5	Costa Rica	A consultation process that comprised different modalities, including the SNGs.	X	
6	Ecuador	Used a participatory, multi-actor, multi-sectoral and multi-level process which worked with the different government sectors at the national and local levels. On a sub-national level, climate change is managed through the REDD+ ⁶⁶ .	X	
7	El Salvador	The National Council of Environmental Sustainability and Vulnerability is a consultative and dialogue body in which a representation of municipality sector participate.	X	
8	Guatemala	The National Council for Climate Change formed by the Central Government, the National Association of Municipalities, the Association of Mayors and Indigenous Authorities and others key actors.		X
9	Honduras	The Honduran Association of Municipalities and the Municipality of the Central District participated and provided information for the development of the BAU including the measures in the roadmap.	X	
10	Mexico	Multilevel coordination mechanisms, related to city climate commitments.	X	X
11	Nicaragua	National Climate Change Mitigation and Adaptation Policy and the NDC, developed through a consultative process with different sectors, municipalities, the productive sector, universities and government agencies.	X	
12	Panama	The NDC development process include the participation of a variety of sectors, with representation of the ten provinces.	X	
13	Paraguay	The Council of Governors is part of the National Climate Change Commission.	X	X
14	Peru	The Climate Change Framework Law requires regional and local governments	X	X

⁶⁵ www.cambioclimatico.gov.co/directorio-del-cambio-climatico

⁶⁶ reddecuador.ambiente.gob.ec/redd/

No.	Country	Multilevel Coordination Initiatives	Participation mechanism of coordination	Institutional mechanism of coordination
		to participate in the National Commission on Climate Change.		
15	Uruguay	National Adaptation Plan-Cities was based on coordinated work with national, departmental and local government agencies as well as with the academy and private sectors.	X	

Source: (ECLAC, 2020) and desk review of each country

Furthermore, there are networks of municipalities for the climate that have been established at the national and international level as spaces for capacity building, networks for the exchange of experiences and the promotion of territorial climate initiatives. Some examples at the national level are the Argentine Network of Municipalities facing Climate Change; the Regional Climate Change Committees and the Chilean Network of Municipalities facing climate change; and in Guatemala, the Latin American Network of Municipalities, Cities and Territories facing Climate Change is being promoted.

At the international level, the main SNGs climate networks or platforms to which several subnational authorities in the LAC region belong to are C40 Cities, Local Governments for Sustainability (ICLEI), Global Covenant of Mayors for Climate and Energy (GCoM), Under2 Coalition, United Cities and Local Governments (UCLG), and the Global Covenant of Mayors.

4 What are the main prospective actions in decentralization and climate change?

Based on the main findings of what have been the main achievements, barriers and challenges in subnational climate action at the subnational level in the LAC region, a series of potential lines of action are presented here in a prospective manner, and which are structured around the main subnational finance issues developed above:

Line of action 1 - Strengthen intergovernmental coordination for climate action.

The waves of decentralization in LAC took place mostly between the 1980s and 2010s, prior to the growth of awareness around climate change. To the extent that SNGs are increasingly involved in the mitigation and adaptation to climate change, it is as part of the responsibilities that were devolved to them throughout that process. The growing awareness and increasing evidence of the effects of climate change on the population around climate change, calls for stronger intergovernmental coordination and probably a redefinition of functional responsibilities around climate change.

Addressing climate change requires joint and coordinated work between sectors and levels of government to achieve the commitments established in the NDCs. This means that future updates of the NDCs must consider the needs of SNGs, build a shared vision, prepare a joint GHG emissions inventory, and align subnational climate action plans with the country's NDC. This bottom-up approach and intergovernmental coordination are relevant in order to create ownership and acceptance by SNGs for an effective implementation of the NDCs.

Line of action 2 - Increase the quality of spending through climate-resilient subnational public investment.

Most of the measures and actions related to climate change carried out by SNGs, especially in the case of adaptation programs, are framed into public investment projects. For this reason, it is necessary to work on methodological guidelines to incorporate climate vulnerability and risk analysis from the planning of infrastructure works, as well as to establish a social price of carbon for the economic evaluation of public investment projects.

It is also necessary to strengthen the implementation of results-based budgets that allow, from the formulation of the draft budget bill, the incorporation of climate change diagnosis for the inclusion of indicators along the public value chain.

Line of action 3 - Implement subnational environmental taxes and fees and review tax expenditures with a climate impact.

Implementing measures and actions to address climate change requires a review of the taxation powers assigned to the SNGs so that they can implement "green" or environmental taxes and charges that fulfill the dual purpose of generating their own revenues to cover the costs of providing goods and services with a climate impact, while at the same time encouraging changes towards sustainable, low-carbon consumption and production patterns.

Similarly, it is necessary to review tax expenditures introduced in subnational taxes and fees with positive and negative impacts on climate change, especially in areas related to energy, transportation, pollution, and natural resources extraction.

Line of action 4 - Strengthen intergovernmental transfer systems, especially those linked to NRNR, so that they effectively contribute to mitigate environmental and social costs of extractive industries.

There is ample room to improve transfers linked to NRNR so that a relevant fraction of them is conditioned on actions to mitigate the environmental and social costs of extractive industries.

This conditionality should be coupled with technical assistance to SNG to make sure those resources are used in an efficient and effective manner.

Line of action 5 - Promote the mobilization of climate finance for SNGs.

Implementing climate actions to reduce vulnerability through resilient infrastructure; addressing emergency and recovery from natural disasters due to climate events; and contributing to

international efforts to reduce GHG emissions implies that SNGs need access to different climate finance instruments (concessional credits, grants, and green bond issuance).

Line of action 6 - Improve transparency and accountability processes for NSG climate efforts.

Improve the generation and flow of subnational climate information, including the identification and quantification of public climate expenditure and MRV systems at the subnational level, thereby strengthening transparency and accountability processes.

For SNGs to report their public climate expenditure, they need to implement methodologies aimed at identifying, collecting and quantifying their financial management systems in order to allow comparability with other levels of government to facilitate consolidation at the national level in a financial MRV.

Line of action 7 - Development of technical and institutional capacities related to climate change and climate change financing.

SNGs in the region have different needs, knowledge, and capacities to address climate change. This is in addition to the fact that the issue of climate change is complex, has a series of specialized concepts and requires the generation of specific information to assess and monitor exposure and vulnerability to climate change.

Therefore, it is necessary to establish technical capacity building programs aimed at local officials through academic training and peer-to-peer exchange networks to share practical experiences on subnational climate action.

It is also important to strengthen financial management systems to make public climate expenditure transparent, but also to create information systems on climate fiscal risks aimed at improving territorial planning and management, as well as to promote monitoring and evaluation of subnational climate action plans.

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Annex 1. Urban Public Transportation Expenditures Assignment

Country	Exclusive assignment Central Government	Exclusive assignment Intermediate Government	Exclusive assignment Local Government	Concurrent assignments with others levels of governments (C=Central, I = Intermediate, L=Local
Argentina				C/I
Bolivia	X			
Brazil				C/L
Chile			X	
Colombia				C/L
Costa Rica	X			
Ecuador				C/L
El Salvador	X			
Guatemala			X	
Honduras			X	
Mexico				C/I
Nicaragua				C/L
Panama			X	
Paraguay				C/L
Peru				C/I/L
Uruguay		X		
Venezuela				C/I/L

Source: authors

Annex 3. Examples of Initiatives of Water Funds

Country	City	Level of government	Initiative
Brazil	Sao Paulo	Local	<i>Programa Produtor de Água São Paulo</i>
Bolivia	El Alto and La Paz	Local	Constructed reservoirs with water storage in Bofedales wetlands immediately below glacial outflow.
Colombia	Bogota	Local	Water we are
	Medellin	Local	Green Watershed
	Manizales	Local and Intermediate	Water Fund Manizales – Vivo Cuenca
	San José de Cúcuta, Santander	Local and Intermediate	Bio Cuenca Alliance
Costa Rica	Rio Grande and Rio Virilla	Central	Tica Water
Ecuador	Cuenca	Local	Water Fund for the Conservation of the Paute River
	Guayaquil	Local	Guayaquil Water Fund for the recovery of the Daule River
	Quito	Local	Environmental Trust Fund for the Protection of Quito's Water
	Tungurahua	Intermediate	Tungurahua Moorland Fund
Guatemala	Guatemala	Local	Metropolitan Region of Guatemala Fund
Mexico	Mexico DF	Local	Capital Water Fund The National Water Reserves Program of Mexico
	Guanajuato	Intermediate	Water Fund Guanajuato
	Monterrey		Water Fund Monterrey
Peru	Lima and Callao	Local	AquaFondo

Source: Authors

Annex 2. Allocation of Environmental Protection Spending Responsibilities

Country	Concurrent assignments with others levels of governments (C=Central, I = Intermediate, L=Local)
Argentina	C/I
Bolivia	C/L
Brazil	C/I/L
Chile	C/I
Colombia	C/I/L
Costa Rica	C/L
Ecuador	C/I/L
El Salvador	C/L
Guatemala	C/L
Honduras	C/L
Mexico	C/I/L
Nicaragua	C/L
Panama	C/L
Paraguay	C/L
Peru	C/I/L
Uruguay	C/L
Venezuela	C/L

Annex 3. Subnational Greenhouse Gas Emission Inventory in LA Region Reporting through GGP Methodology

Country	City	Boundary	Years reported	Last year	Net Basic Stationary energy	Net Basic Transport	Net Basic Waste
Colombia	Bogotá	Administrative boundary of a local government	2012 and 2017	2017	3,911,669	5,419,433	2,090,622
Argentina	Buenos Aires	Administrative boundary of a local government	2000 to 2017	2017	6,550,255	3,568,526	1,833,879
Brazil	Curitiba	City / Municipality	2013 and 2016	2016	1,617,095	2,354,066	374,501
Mexico	Guadalajara	Metropolitan area	2016	2016	6,371,017	6,200,757	2,938,853
Peru	Lima	Metropolitan area	2012 and 2015	2015	6,340,795	6,355,530	3,093,113
Colombia	Medellin	City / Municipality	2015	2015	1,335,154	1,482,683	744,959
Mexico	Mexico City	Administrative boundary of a local government	2012, 2014, 2016 and 2018	2018	10,910,294	17,143,716	4,475,289
Ecuador	Quito	Metropolitan area	2015	2015	1,988,306	3,004,296	766,587
Brazil	Rio de Janeiro	Administrative boundary of a local government	2012 to 2017	2017	7,112,206	6,052,752	3,245,174
Brazil	Salvador	Administrative boundary of a local government	2014 to 2018	2018	621,941	1,392,029	382,386
Chile	Santiago	Administrative boundary of local authority	2016	2016	12,214,268	8,503,283	2,455,580
Brazil	São Paulo	Administrative boundary of local authority	2010 to 2017	2017	4,584,272	9,576,663	1,257,135

Source: <https://ghgprotocol.org/greenhouse-gas-protocol-accounting-reporting-standard-cities>