

# Reforms to Foster Sustainable and Inclusive Infrastructure in Latin America and the Caribbean

Ariel Yépez-García  
Lenin H. Balza  
Tomás Serebrisky





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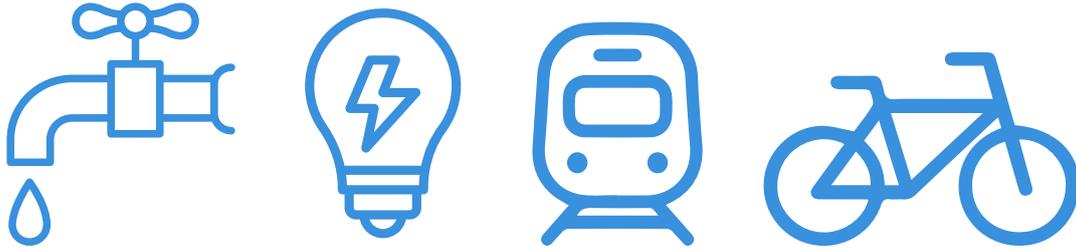
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## Abbreviations

**CRED:** Centre for Research on the Epidemiology of Disasters

**EAP:** East Asia and the Pacific

**ECA:** Europe and Central Asia

**ECLAC:** Economic Commission for Latin America and the Caribbean

**GDP:** Gross domestic product

**ICTs:** Information and communication technologies

**LAC:** Latin America and the Caribbean

**MENA:** Middle East and North Africa

**PPP:** Public-private partnerships

**SA:** South Asia

**SDGs:** Sustainable Development Goals

**SNIP:** National Public Investment Systems

**SSA:** Sub-Saharan Africa

**UNICEF:** United Nations Children's Fund

**WHO:** World Health Organization



## Key messages

**With a few exceptions, infrastructure services provision in Latin America and the Caribbean needs to be of a higher quality, is not accessible to all, and is unaffordable for many.**

- The quality of infrastructure services in Latin America and the Caribbean has been lagging. Despite positive developments in the quality of infrastructure in most countries, the region still fails to provide high-quality infrastructure services.
- Universal coverage of infrastructure services remains an issue to be resolved in Latin America and the Caribbean. The region has made great efforts to increase access to services in recent decades, with a view to closing the gap between urban and rural areas, but much remains to be done to achieve universal coverage of such services.
- Infrastructure services, after foodstuffs, comprise the most significant budgetary component of the household consumption basket for all income groups. The region's households spend more on infrastructure services than those in any other developing region.

**Increasing the rate of investment in infrastructure is one of the most significant development challenges the region will face in the coming decades. The countries of the region must invest more.**

- The countries of the region invest about 1.8 percent of regional GDP per year in infrastructure (average investment, 2008–2019). This is substantially less than the amount recorded in other emerging economies.
- Latin America and the Caribbean needs to invest at least 3.1 percent of its GDP per year (equivalent to US\$ 185 billion) by 2030 in the water and sanitation, energy, transportation and telecommunications sectors, so as to expand and maintain the infrastructure needed to make progress on meeting the infrastructure-related Sustainable Development Goals.
- Investing in new infrastructure and closing the gap to meet the Sustainable Development Goals entails an additional annual effort of US\$ 75 billion (a 70 percent increase in the average annual investment rate over the past decade).

**An increase in both public and private investment is required. Nonetheless, given the limited fiscal space available in most countries of the region, the governments must create conditions that are conducive to a swift increase in private-sector involvement.**

- There is enormous potential for financing by private actors. Institutional investors in the region—especially pension funds, mutual funds, and insurance companies—handle assets of US\$ 1.5 trillion (close to 30 percent of regional GDP), but they invest less than 1.1 percent of the total in infrastructure assets.



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**Latin America and the Caribbean not only needs to invest more in infrastructure, it also needs to invest better. The infrastructure sector needs to be rethought, reformed and updated, and urgent changes should be made to its governance so as to increase its productivity and competitiveness—with a renewed focus on social and environmental sustainability. The region needs a new sectoral architecture (institutions, regulatory agencies, ministries, commissions, processes and instruments) to ensure that service provision meets the demand in quantity and quality, while at the same time promoting efficient schemes to provide services at affordable and equitable prices (Table 1).**



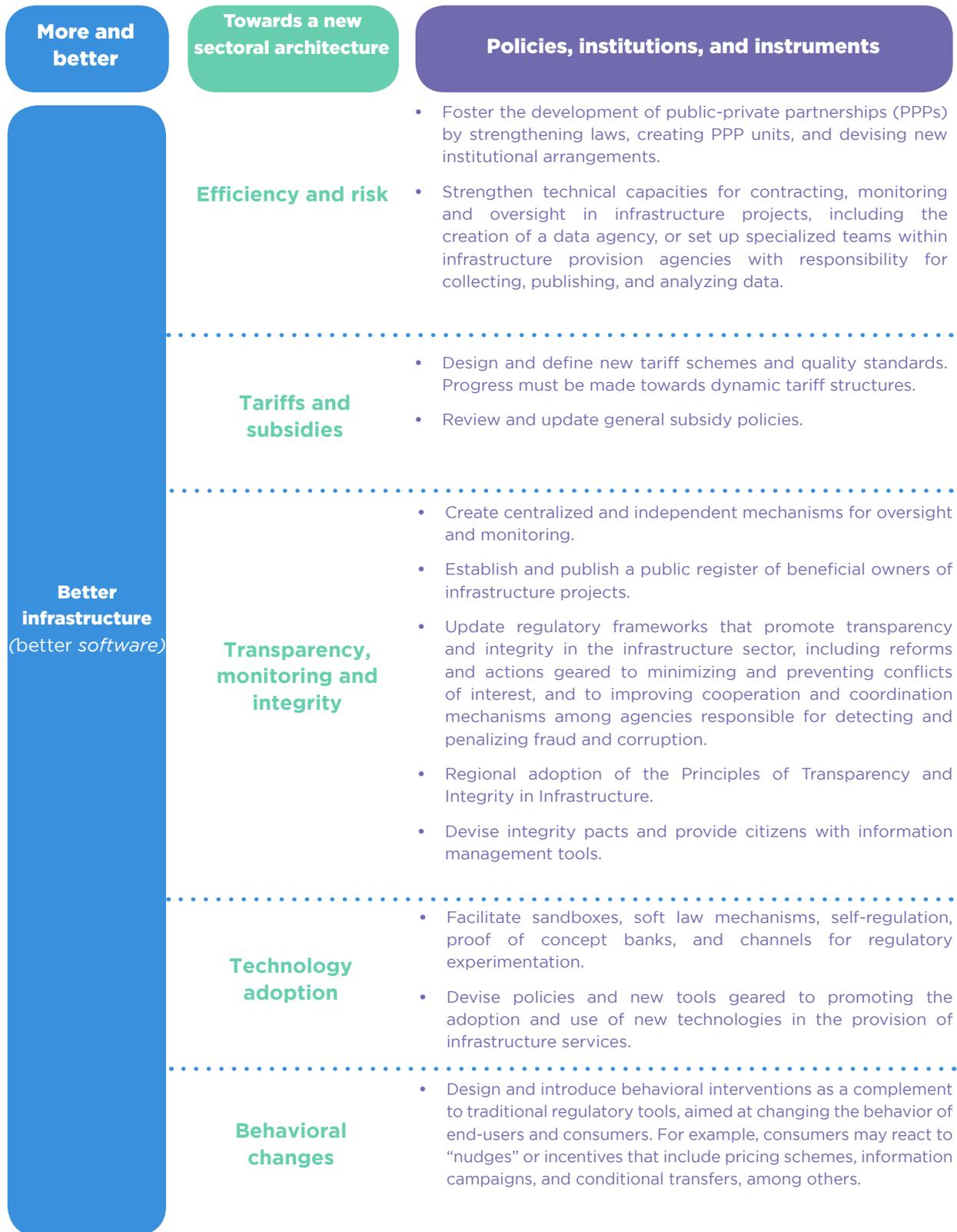
**Reforms to Foster Sustainable and Inclusive Infrastructure**

**Table 1.** The Path to More and Better Infrastructure: What Is Needed and How Should It Change?

More and better	Towards a new sectoral architecture	Policies, institutions, and instruments
<p><b>More infrastructure</b> (more <i>hardware</i>)</p>	<p><b>Planning and preparation</b></p>	<ul style="list-style-type: none"> <li>• Create a national infrastructure agency with autonomy and independence, and with a mandate to plan a portfolio of medium- and long-term projects aligned with climate goals and nationally determined contributions. It should also have the capacity to conduct rigorous assessments, with a view to choosing and prioritizing infrastructure projects that have the greatest impact and social return.</li> <li>• Strengthen national public investment systems (agencies that are typically part of the ministries of economy and finance) that play a crucial role in the budget allocation cycle, regulatory harmonization, prioritization, and the operational decentralization of infrastructure projects.</li> </ul>
	<p><b>Private investment</b></p>	<ul style="list-style-type: none"> <li>• Promote the development of infrastructure as an asset class, including new reforms that facilitate the participation of institutional investors in financing infrastructure projects. That requires, among other things, the improvement and updating of regulatory frameworks, tax systems, local legislation, and accounting arrangements, as well as greater depth in the capital market.</li> <li>• Strengthen financial markets focused on using infrastructure investment projects as financial assets, including the development of new instruments for risk mitigation and management in infrastructure projects. Progress must be made on the standardization, replicability, and scalability of instruments.</li> <li>• Develop asset recycling strategies.</li> </ul>
	<p><b>Fiscal rules</b></p>	<ul style="list-style-type: none"> <li>• Design fiscal rules that make it possible to protect investment and maintenance spending for infrastructure projects, especially in periods of reduced revenues and fiscal consolidation.</li> </ul>
	<p><b>Sustainable infrastructure and climate change</b></p>	<ul style="list-style-type: none"> <li>• Assess existing infrastructure to determine its capacity to respond to climate change. Invest to ensure the resilience of infrastructure, so as to guarantee proper service provision.</li> <li>• Incorporate elements of climate resilience into planning and development processes, including principles of circular economy and waste reduction from the early stages of new projects.</li> <li>• Include climate objectives in the planning of new infrastructure projects, including the determination and pricing of externalities associated with carbon emissions. Similarly, establish a roadmap of sectoral investments and policy reforms required for a just transition through the development of “decarbonization plans.”</li> <li>• Design sectoral strategies for the risk management of stranded assets.</li> </ul>



## Reforms to Foster Sustainable and Inclusive Infrastructure



Source: Prepared by the authors on the basis of various sources.

For more details see the chapter below, [A new regulatory architecture: The path towards more and better infrastructure](#).



## Introduction

Transportation, energy, and water and sanitation services are essential for people's wellbeing and for companies' competitiveness, and thus they are a crucial element of countries' strategy for development and social inclusion. In line with the Sustainable Development Goals (SDGs), Latin America and the Caribbean faces the challenge of attaining universal access to quality services that are affordable and sustainable.

Given that the COVID-19 pandemic has had impacts on the provision of infrastructure services (Yépez-García et al., 2022a), the challenge of providing more and better infrastructure not only persists but has become even more pressing. The current infrastructure gap is simultaneously a challenge and an opportunity for the countries of the region to energize their economies in the post-pandemic recovery. Complying with those aspects of the SDGs that are related to infrastructure services would require the region to invest US\$ 2.2 trillion by 2030—an average annual investment of 3.12 percent of regional GDP (Brichetti et al., 2021). As well as being indispensable in improving quality of life, infrastructure investment has the potential to create employment so as to reverse the effects of the pandemic-induced economic downturn (Yépez-García et al., 2022b).

What must countries do, then, to foster sustainable and inclusive infrastructure development effectively? A first and highly important requirement is to attract more resources to infrastructure by improving funding and financing, especially from the private sector, to boost investment (Alvarez et al., 2022). Latin America and the Caribbean, however, not only needs to invest more in infrastructure, it also needs to invest better. To that end, it is essential that the region prioritize the adoption of a broad range of policies to improve the way in which investment in infrastructure is made. Policy reforms that guide infrastructure investment should be seen as a key element of a new social compact (Izquierdo et al., 2020). Regulatory and institutional frameworks that foster efficiency in service provision and promote competition, including infrastructure planning, help ensure that it is carried out in line with technical criteria and with the goal of meeting economic, social and environmental objectives (Cavallo et al., 2020). Moreover, countries need legal stability that builds confidence and attracts private investment (Alvarez et al., 2022; Serebrisky et al., 2015), as well as policies geared to introducing incentives for innovation by companies and consumers (Cavallo et al., 2020). All these measures are necessary to heighten the quantity and quality of the region's assets. They must be matched by reforms in the governance of infrastructure, promoting a regulatory framework with institutions that use modern regulatory instruments in a fair and transparent manner to ensure the provision of sustainable infrastructure services.

The rest of this study is organized as follows. Section 2 describes the regional context and elaborates on some empirical regularities of the infrastructure sector in Latin America and the Caribbean. Section 3 outlines the conceptual framework used to map out the reform agenda required in the infrastructure



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sector. Section 4 presents the emerging trends that affect the speed and urgency of the required reforms. Finally, Section 5 explores a set of reforms and institutional changes—including policy reforms and the creation of new instruments—aimed at reactivating and increasing investment in infrastructure and the quality of the services provided.

## Context and stylized facts

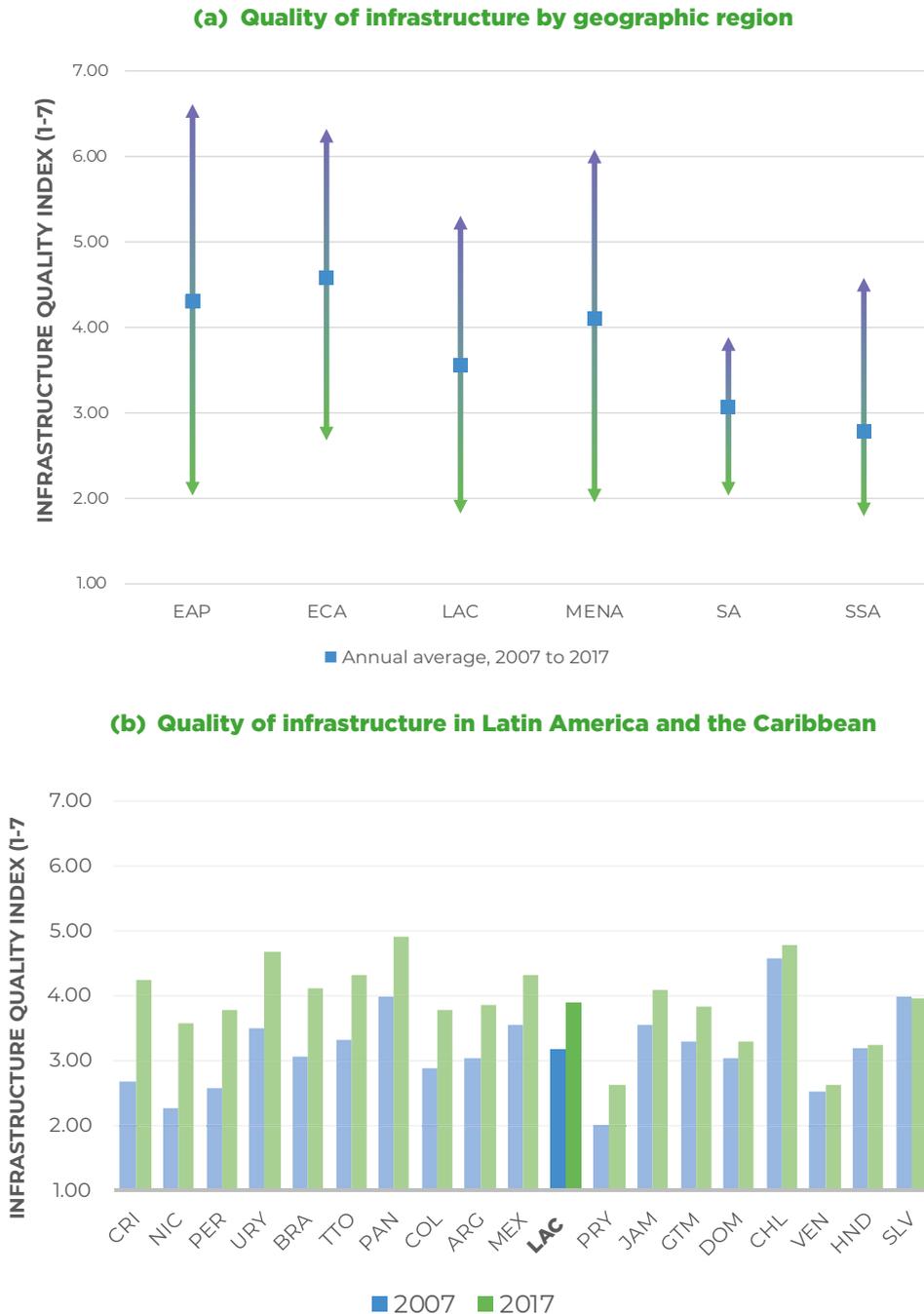
Electricity, transportation, and water and sanitation are essential infrastructure services in modern societies. Infrastructure is an engine of countries' economic and social growth. It is key to social inclusion, to the provision of basic goods and services, and to the overall wellbeing of current and future generations.

Infrastructure services are as fundamental for individuals as they are for businesses. For the former they are essential in people's daily lives, and are present in all the human activities we perform. For the latter, they are critical inputs for production and supply chains; the quality and/or lack of them directly influence the cost structure and competitiveness of the production system. High quality, reliable and safe infrastructure services are required, produced efficiently and provided at the lowest cost. Nonetheless, the quality of infrastructure services provision in Latin America and the Caribbean, with some exceptions, needs to be improved; is not accessible to all and is unaffordable for many (Cavallo et al., 2020).

The quality of infrastructure services in Latin America and the Caribbean has been lagging. According to the World Economic Forum's Global Competitiveness Report, the region's index of perceived infrastructure quality is lower than that of other regions in the world, except for Sub-Saharan Africa and South Asia (Figure 1.a). Although the overall infrastructure quality index in Latin America and the Caribbean has evolved favorably, the increase is below that elsewhere in the world, particularly in emerging regions such as Asia and Eastern Europe. The aggregate regional figures, moreover, mask wide differences between countries. For example, Chile, Panama, and Uruguay stand out as the countries with the best infrastructure quality in the region. The countries' perceived quality index has certainly evolved positively, and some of them—such as Costa Rica, Nicaragua and Peru—have made significant progress. Despite the positive development of infrastructure quality in most countries, however, the region still fails to provide high-quality infrastructure services (Figure 1.b).

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**Figure 1. Quality of Infrastructure**



Notes: This figure presents infrastructure quality statistics using the index (from 1 to 7, where 1 is the lowest quality and 7 is the highest) from the World Economic Forum’s Global Competitiveness Report (WEF, 2017). Countries are arranged in descending order using the difference in the quality index between 2017 and 2007. Figure 1.a. presents the aggregate data, by geographic region, on the annual average by country from 2007 to 2017. For this period, the minimum, maximum, and average for each region are plotted. The regions are East Asia and the Pacific (EAP), Europe and Central Asia (ECA), Latin America and the Caribbean (LAC), Middle East and North Africa (MENA), South Asia (SA), and Sub-Saharan Africa (SSA). Figure 1.b. presents the value of the index by country in Latin America and the Caribbean for 2007 and 2017. The regional value added LAC for LAC corresponds to the average of all countries in the region per year. Belize, Bolivia, Barbados, Ecuador, Guyana, Haiti and Suriname are excluded from the sample because they lack complete information for the period 2007–2017.

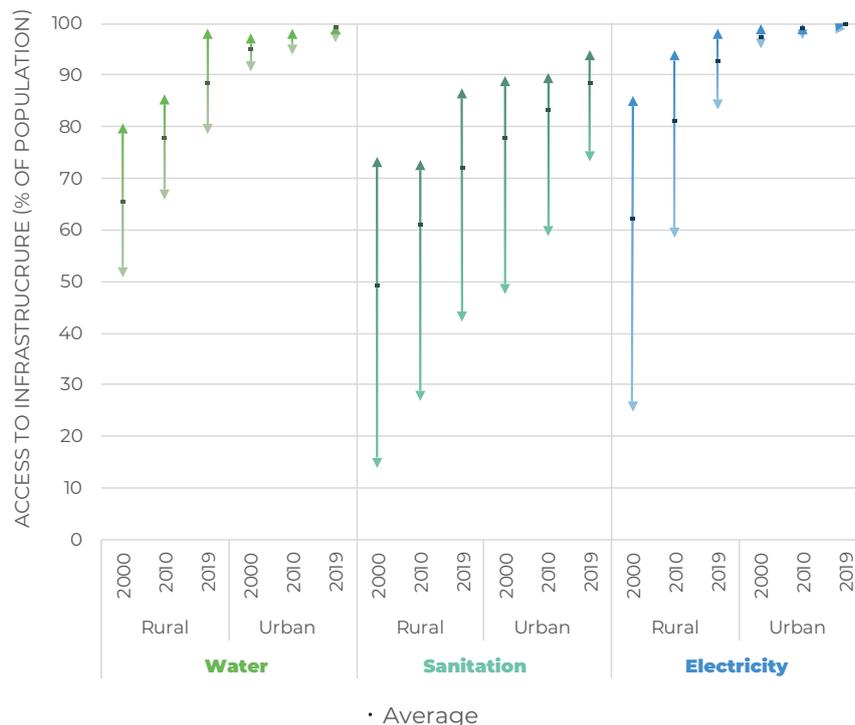
Source: Prepared by the authors on the basis of data from the World Economic Forum (WEF, 2017).



## Reforms to Foster Sustainable and Inclusive Infrastructure

Attaining universal coverage of infrastructure services remains a pending issue for Latin America and the Caribbean. The benefits associated with infrastructure services materialize with access to those services. Providing access to electricity, transportation, and water and sanitation services has a positive impact on a wide range of development dimensions and outcomes, including education, incomes, health, gender, labor market participation, and productivity, among many others (Jimenez Mori, 2020; Clasen et al., 2015; Elburz, 2017). For example, access to electricity increases the number of hours a child can study, resulting in better school performance and a better quality of human capital. That in turn helps boost their chances of finding employment and earning income in the medium and long terms (Jimenez Mori, 2020). A drinking water service reduces the risk of morbidities associated with the consumption of contaminated water (Clasen et al., 2015). And the availability of transportation networks increases the chances of accessing employment, health and educational opportunities (IDB, 2020). Latin America and the Caribbean has made great efforts to increase access to electricity, transportation, water and sanitation services in recent decades, and to close the access gap between urban and rural areas (Figure 2). Nonetheless, much remains to be done to achieve universal coverage of infrastructure services.

**Figure 2.** Access to Infrastructure in Latin America and the Caribbean, 2000–2019



Notes: This figure presents annual statistics on access to infrastructure as a percentage of the population living in urban and rural areas in Latin America and the Caribbean. The access statistics present disaggregated information by type of infrastructure (water, sanitation, and electricity) on the minimum, maximum, and average for the region. The sample includes countries on which there is information for 2000, 2010, and 2019. For water and sanitation the same sample of countries is used, but indicators are available for the three years of interest. Access to water is defined as the percentage of the population with basic access to water at their residence or within 30 minutes of their residence. Access to sanitation refers to households that have access at home and that do not have to share the service.

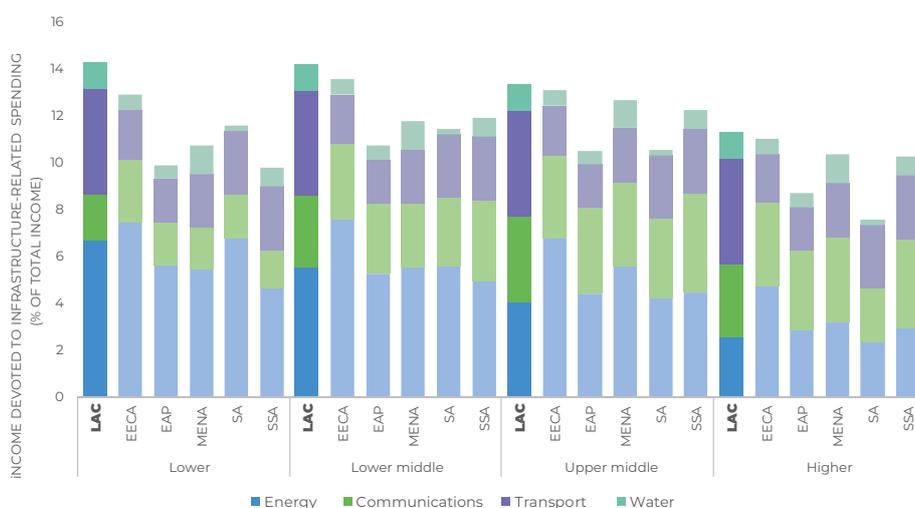
Source: Prepared by the authors on the basis of data from the Centre for Distributive, Labor and Social Studies (CEDLAS and the World Bank, 2021) for electricity access indicators; and from the World Health Organization/United Nations Children’s Fund Joint Monitoring Program (WHO and UNICEF, 2022).

  
**Reforms to Foster Sustainable and Inclusive Infrastructure**

As well as providing physical access to infrastructure services, a fundamental element of the goal of universal provision of these services is to ensure they are affordable. In other words, it is important to guarantee that the price allows households to enjoy reasonable levels of consumption of services without preventing them from meeting other basic needs. In Latin America and the Caribbean, the prices of infrastructure services are higher than in other developing regions, especially for electricity. In the electricity sector, average prices for final consumers are the highest among developing regions, although lower than the prices in advanced economies. For drinking water services, the tariffs are higher than those in other developing regions, even for households with lower consumption levels (Brichetti, 2019). The evidence available in the transportation sector suggests that the poorest households in the region cannot pay for the services they need; people from those households have to walk or opt not to travel at all (Cavallo et al., 2020; Rivas et al., 2018).

Paying for infrastructure services can impose a significant financial burden on household budgets, especially for the most vulnerable households. In Latin America and the Caribbean, infrastructure services comprise the most significant budgetary component in the consumption basket, after food, for all income groups (Jimenez Mori and Yepez-García, 2020). Figure 3 shows the importance of direct spending on infrastructure services relative to households' disposable income. The composition of spending shows that households in Latin America and the Caribbean spend more on infrastructure services than households in any other developing region, across all income groups. This budget structure illustrates households' vulnerability to changes in the prices of infrastructure services, especially the effect on the cost of living of the poorest households. The affordability of infrastructure services in Latin America and the Caribbean is a real problem.

**Figure 3. Infrastructure-Related Spending by Households (as % of Total Income)**



Notes: This figure presents estimates of household spending on infrastructure as a percentage of total income by region, income level, and type of infrastructure for 2010. The regions are East Asia and the Pacific (EAP), Eastern Europe and Central Asia (EECA), Latin America and the Caribbean (LAC), Middle East and North Africa (MENA), South Asia (SA), and Sub-Saharan Africa (SSA).

Source: Prepared by the authors on the basis of data from Estache, Bagnoli, Bertomeu-Sanchez (2018).



## Reforms to Foster Sustainable and Inclusive Infrastructure

It is important to point out that although the prices of infrastructure services in Latin America and the Caribbean are higher than in other developing regions, this does not mean that service providers cover the costs of providing such services.

Costs are the other side of the coin, and therefore efficiency in the management of infrastructure services is key. Evidence from Latin America and the Caribbean suggests that infrastructure service providers rarely manage to recover the cost of provision through tariff schemes. In the water sector, for example, 80 percent of water providers fail to generate a revenue stream to cover their operating and maintenance costs (Fay et al., 2017). The story is the same in the transportation sector. For instance, urban transportation service providers in Panama City only manage to cover half of their operating costs with fare revenues, while in Buenos Aires such revenues only cover a third of costs (Scorcia, 2018).

Public transfers or compensation schemes (subsidies) are another sign that infrastructure service providers fail to recover costs through various tariff schemes. Public transfers account on average for about 0.7 percent of GDP (Rivas et al., 2020).<sup>1</sup> In the electricity sector, for example, it is estimated that 70 percent of the countries in the region provided subsidies or some type of assistance to the sector during the past decade (Marchan et al., 2017).

### **Latin America and the Caribbean needs more and better infrastructure**

The challenges of universal coverage, the poor quality of infrastructure services, relatively high prices and service providers' poor cost recovery through tariff schemes mean that the region's infrastructure sector needs to invest more and better. Nonetheless, it is not all about investing more and better; central to the sector's future agenda is the need to operate and maintain infrastructure assets properly, so as to ensure the provision of high-quality, equitable, and affordable services.

Countries in the region invest about 1.8 percent of their regional GDP in infrastructure annually (Brichetti et al., 2021), an amount that is substantially less than other emerging economies. For example, East Asia and the Pacific has an investment rate of 5.7 percent of GDP, while the infrastructure investment rate in the Middle East and North Africa stands at 4.8 percent of GDP (Fay et al., 2019). Increasing the rate of investment in infrastructure is one of the most significant development challenges that the region will face in the coming decades.

There is no consensus on how much should be invested, but it is estimated that Latin America and the Caribbean must invest at least 3.1 percent of its GDP per year in the water and sanitation, energy, transportation and telecommunications sectors, so as to expand and maintain the infrastructure

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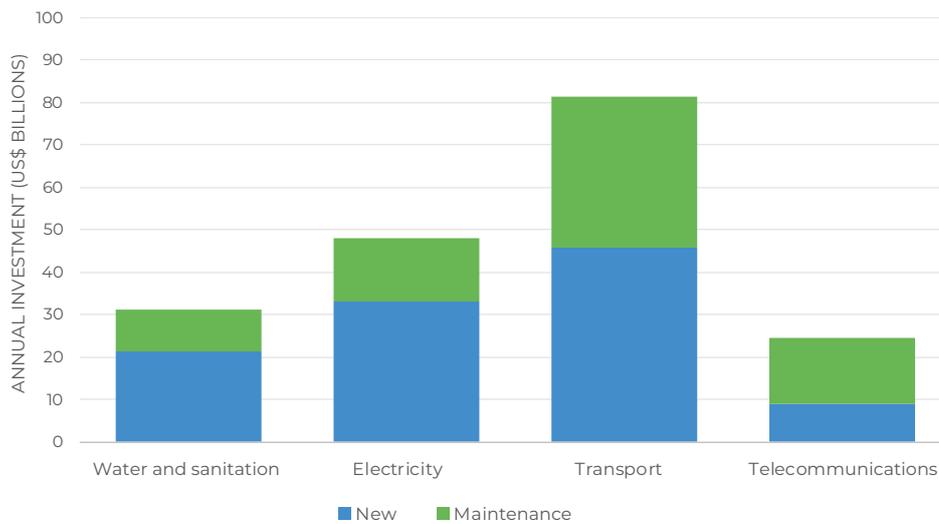
<sup>1</sup> Applies to a sample of countries in Latin America and the Caribbean, including Argentina, Brazil, Chile, Colombia, Mexico, Panama, Peru, and Uruguay.

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needed to make progress on meeting the infrastructure-related Sustainable Development Goals (Brichetti et al., 2021).<sup>2</sup> In short, the region will have to spend the equivalent of US\$ 185 billion per year until 2030 on investments for new infrastructure, maintenance investments, and replacement of assets that reach the end of their useful life and that are indispensable for infrastructure services to be provided with adequate quality standards (Figure 4).

**Figure 4.** Annual Investment Effort to Meet the Sustainable Development Goals in Latin America and the Caribbean (US\$ billions)



Notes: This figure presents estimates of the annual investment needed to comply with the infrastructure component of the Sustainable Development Goals by 2030. Investment values can be disaggregated into new investment and investment in maintenance of the infrastructure stock.

Source: Prepared by the authors on the basis of data from Brichetti et al. (2021).

Investing in new infrastructure and closing the gap to meet the infrastructure-related Development Goals entails an additional annual effort of US\$ 75 billion, or a 70 percent increase in the average annual investment rate over the past decade (Brichetti et al., 2021). The total of these investments include the need to achieve universal access to water and sanitation services, including wastewater treatment in urban areas; close the access gap in the electricity sector and provide the electricity required to ensure adequate service provision; invest in roads and highways, airports, and public transportation; and increase broadband and 4G-standard mobile internet connectivity by the end of this decade.

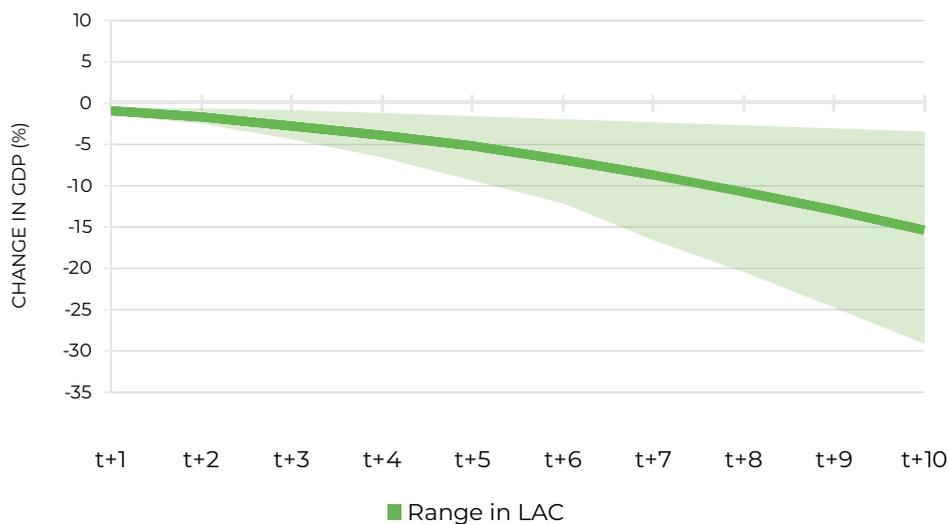
<sup>2</sup> The water and sanitation sector, including wastewater treatment, requires annual investments averaging 0.5 percent of regional GDP. In the electricity sector, the region needs to invest 0.8 percent of its GDP annually. In the transportation sector, closing gaps in road, airport and public transportation infrastructure requires an annual investment of 1.4 percent of the region's GDP. In the telecommunications sector, increasing household connectivity through broadband and mobile internet technologies with 4G standard requires an average annual investment of 0.4 percent of GDP.

## The cost of not investing more

Infrastructure investment directly affects the level of economic activity in both the short and long terms. In the short term, it boosts countries' aggregate demand (greater demand for inputs and employment), while in the long term it increases the productive capacity of economies by generating a greater number of infrastructure assets (IMF, 2014).

Not investing in new infrastructure entails huge macroeconomic costs for the region. Brichetti et al. (2020) show the associated cost for the growth path of not increasing the capital stock in infrastructure sectors (only depreciation is covered). Figure 5 illustrates the cumulative impact of not adding new capital to existing stocks for a sample of LAC countries. After 10 years without further investment, economic growth falls by 15 percent on average, relative to its potential.

**Figure 5. Impact on Gross Domestic Product of Not Investing in Infrastructure**

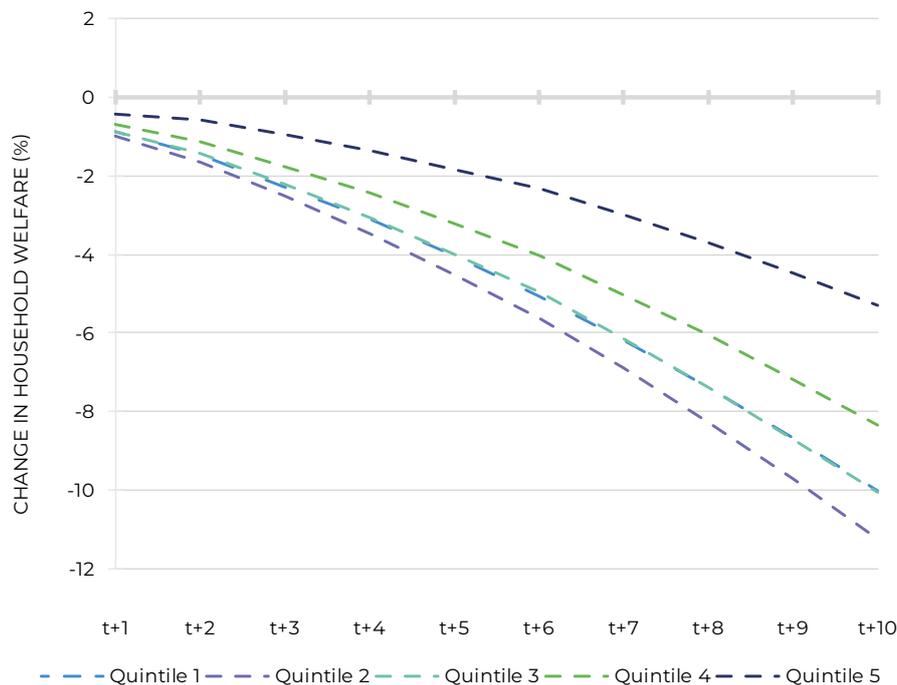


Notes: This figure presents estimates of the average impact of disinvesting in infrastructure over 10 consecutive years for six countries in Latin America and the Caribbean: Argentina, Bolivia, Chile, Costa Rica, Jamaica, and Peru. The area around the average is the minimum and maximum value that the change in GDP can take each year for the sample of the six countries. The percentage change in GDP is read with respect to a scenario in which GDP grows in line with its investment potential.

Source: Prepared by the authors on the basis of data from Brichetti et al. (2020).

Underinvesting in infrastructure is also regressive. A failure to increase the capital stock in infrastructure sectors affects the distribution of household income. Figure 6 shows the cumulative impact of not expanding the capital stock in the infrastructure sectors (only depreciation is covered) over 10 years. The poorest households in the income distribution lose a larger percentage of real income than the richest households.

**Figure 6.** Impact on Household Welfare of Not Investing in Infrastructure



Notes: This figure presents estimates of the average impact of disinvesting in infrastructure (only depreciation is covered) over a period of 10 consecutive years for six countries in Latin America and the Caribbean: Argentina, Bolivia, Chile, Costa Rica, Jamaica, and Peru. The impact can be disaggregated by household income quintiles.

Source: Prepared by the authors on the basis of data from Brichetti et al. (2020).

### It takes more than good intentions

Latin America and the Caribbean needs to invest more to close the infrastructure gap. An increase in both public and private investment is required. The necessary investment effort poses a challenge in terms of the amount, the way in which it is mobilized, and the economies' real capacity to absorb it. The public sector's true capacity to invest more in infrastructure is conditioned by the limited fiscal space available in most countries of the region, especially as a result of the efforts and programs to help businesses and households cope with the pandemic, coupled to the small share of public investment in total public spending.

While a substantial increase in public investment in infrastructure is unlikely, countries should make efforts at least to reverse the bias against capital spending within the structure of public expenditure. In recent decades, Latin America and the Caribbean has had a long record of bias against public investment in countries' spending policies. This has resulted in a 9.7 percent decline in the share of capital spending (of which infrastructure is one of the main components) in total public spending, in favor of current spending (Izquierdo et al., 2018). In fact, infrastructure spending is highly procyclical and is the target of cuts at times of budgetary constraints and fiscal consolidation (Ardanaz and Izquierdo, 2017).



## Reforms to Foster Sustainable and Inclusive Infrastructure

While the public sector has financed the bulk of infrastructure in Latin America and the Caribbean, it is urgent that the governments of the region create the conditions required to boost private participation. There is enormous potential for financing by private actors. Institutional investors in the region—especially pension funds, mutual funds, and insurance companies—handle assets of US\$ 1.5 trillion (close to 30 percent of regional GDP), but invest less than 1.1 percent of the total in infrastructure assets.<sup>3</sup> Increasing the share of private investment in infrastructure requires coordinated actions to strengthen and update regulatory and institutional capacity, as well as to promote infrastructure as an asset class, thereby making it possible to channel private savings to the sector (Serebrisky et al., 2015).<sup>4</sup>

The region's infrastructure sector needs to be rethought, reformed, and updated. Urgent changes should be made to its governance so as to increase its productivity and competitiveness, with a renewed focus on social and environmental sustainability. The region needs a new sectoral architecture (institutions, regulatory agencies, ministries, commissions, processes and instruments) to ensure that service provision meets demand in terms of quantity and quality—while promoting efficient schemes to ensure service provision at affordable and equitable rates. Given that infrastructure services are essential for growth and connectivity, the region has an urgent need to reform the sector.

## Conceptual framework

Regional shortcomings in the provision of infrastructure services reflect a general lack of investment in the sector. The quantity of infrastructure assets has not kept pace with the region's economies, rates of urbanization, or the growth of the middle class. Underinvestment, however, is only part of the problem. Asset management and the performance of the companies that operate the assets also affect the availability and quality of the services provided. Drawing on the Inter-American Development Bank's flagship

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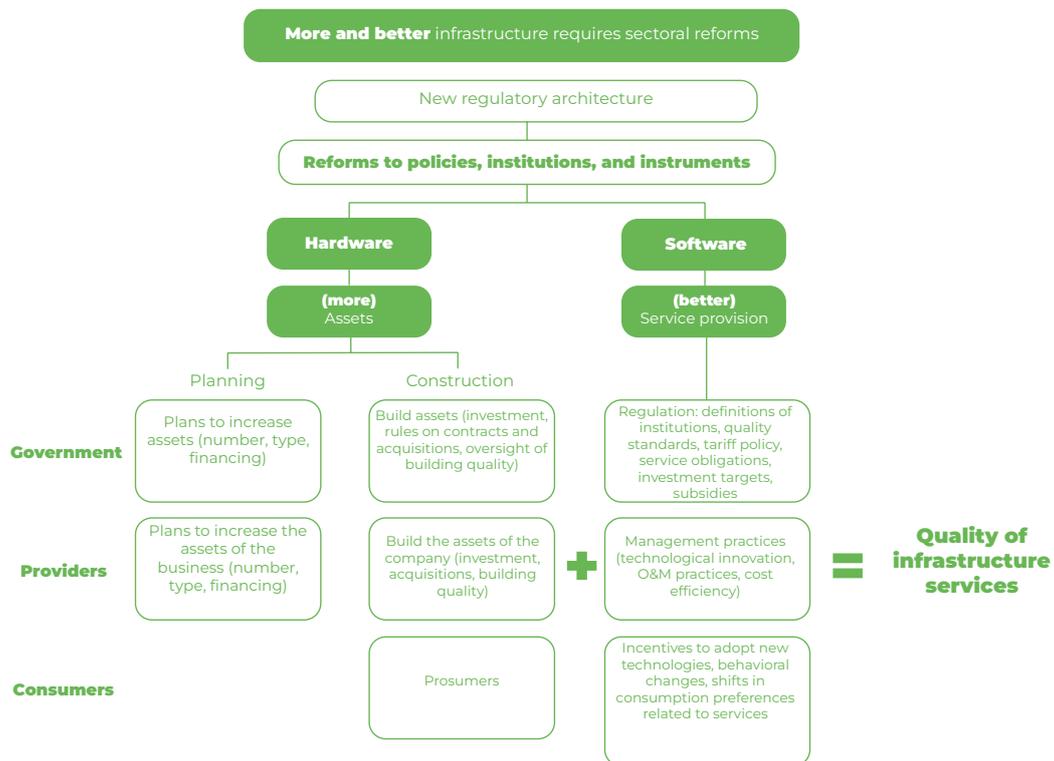
<sup>3</sup>. Latin America and the Caribbean has a growing portfolio of resources managed by institutional investors. In 2021, pension funds alone handled portfolios close to 60 percent of GDP in Mexico, 58 percent in Chile, 31 percent in Colombia, 31 percent in Peru, and 25 percent in Brazil.

<sup>4</sup>. Additionally, there is evidence that greater private participation improves the sector's performance. For example, studies suggest that private participation has raised the efficiency and productivity of ports, reducing transportation costs and increasing trade and competitiveness (Serebrisky et al., 2016; Suárez-Aleman et al., 2018). In the electricity sector, greater private participation in the region is associated with positive performance outcomes, including generation capacity, access, reduced losses, an increase in non-conventional renewables, and affordability (Balza et al., 2020).

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**Reforms to Foster Sustainable and Inclusive Infrastructure**

publication, *From Structures to Services*,<sup>5</sup> Figure 7 illustrates the conceptual framework used to set out a reform agenda for the infrastructure sector. Fostering economic growth, reducing social inequalities and ensuring environmental protection, among other matters, requires setting out a series of reforms that give rise to a new regulatory architecture in the sector—one that revolutionizes both the “hardware” (the number of assets used to provide services) and the “software” (management and competition in service provision, the behavior of companies and users, among other considerations).

**Figure 7. Conceptual Framework (More and Better Infrastructure):**



Source: Prepared by the authors on the basis of Cavallo et al. (2020).

The rest of this section describes the conceptual framework used to analyze the relationships and interactions between infrastructure’s hardware and software. There is a straightforward link between investment in infrastructure assets and the provision of infrastructure services: services can only be provided through assets (structures) that have the required capacity and are in the proper conditions. The provision of infrastructure services, however, depends not only on the quantity and quality of the physical infrastructure but also on other factors—including the management and efficiency of the providers that use that infrastructure to deliver services.<sup>6</sup>

<sup>5</sup> Every year the Inter-American Development Bank presents its flagship publication, Development in the Americas (DIA), which examines the main economic and social challenges facing Latin America and the Caribbean. The 2020 edition focused on an in-depth analysis of the region’s infrastructure sector. For more details, see <https://flagships.iadb.org/en/DIA2020/from-structures-to-services>.

<sup>6</sup> The remainder of this section is based on Cavallo et al. (2020).



## Reforms to Foster Sustainable and Inclusive Infrastructure

In this regard it is important to note the roles that governments, service providers, and consumers play in ensuring the provision of high-quality infrastructure services. Governments typically decide how much and what type of infrastructure to build. They also set the rules of the game, including institutions, ministries, commissions, regulatory bodies, quality standards, and pricing policies, among other matters, that shape the overall incentive framework and govern the provision of infrastructure services. For their part, service providers play a fundamental role in determining the quantity and quality of infrastructure services, and they are an essential link between assets and consumers. Service providers take part in the whole project cycle of infrastructure assets and service provision, including the design, construction, and management of the infrastructure. No less important is the role that service providers play in financing infrastructure.

Technological development has driven changes that are gradually blurring the line between consumers and service providers. Increasingly, consumers are playing a decisive role in the supply of infrastructure services. For example, households and businesses equipped with solar panels can generate electricity for their own consumption, and have increasingly developed the capacity to sell the electricity they generate to the grid. This has transformed the traditional role of consumers, turning them from passive consumers into prosumers.<sup>7</sup> The development of technology platforms has also helped transform other infrastructure services, such as transportation. Such progress has enabled individuals to provide transportation services through platforms with their own assets (for instance, private ride-sharing and ride-hailing services). Moreover, the concerns of households, cities, and industries are changing the type of infrastructure that is built. End consumers are no longer indifferent to the type and quality of infrastructure services, especially as regards their environmental sustainability. Hence we often see civic organizations pushing for the building of bike paths, for urban green infrastructure, or for the direct purchase of renewable energy and electric vehicles.

## Emerging factors and trends that affect the speed and urgency of reforms

Latin America and the Caribbean needs more and better infrastructure. The region needs a new regulatory architecture to ensure that service provision meets demand in terms of quantity and quality, while at the same time promoting the delivery of affordable services. Several factors determine the scope and scale of the necessary reforms, but three of them can be regarded as pillars of the restructuring:

- (i) Digitalization and technological disruption**
- (ii) Climate change and sustainability**
- (iii) Urbanization and rising social demands**

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<sup>7</sup> Prosumers are households that not only consume electricity but also produce it.



## Digitalization and technological disruption

Technological disruptions are changing the way infrastructure services are delivered, with a speed and scale that is hard to grasp. Digitalization, artificial intelligence and machine-learning applications, the rise of the collaborative economy, and the speed at which new technologies are adopted have direct implications for the production and consumption of infrastructure services. In the transportation sector, for example, digital technologies have reconfigured the concept of mobility (movement of people) and logistics (transportation of goods) (Calatayud and Muñoz, 2020).<sup>8</sup> The energy sector is not divorced from this. Digitalization and technological progress are transforming the way we consume and produce electricity. The digitalization of consumption enables deployment of automatic demand responses to price variations, while technological changes are influencing the fragmentation of electricity generation and consumers are becoming prosumers—actors who consume and produce (Hallack et al., 2020). In the water sector, smart technologies have transformed service delivery. The introduction of sensors and smart meters allows the water service to be operated and monitored remotely (Machado, 2020), thereby reducing operating and maintenance costs.

The era of digitalization and the speed of technological change that we are experiencing demands urgent reforms to the regulatory architecture governing the provision of infrastructure services. These transformations require governments in the region to move forward with a new set of reforms, including the development of regulatory institutions and instruments that can establish flexible rules and frameworks, allowing both users and service providers to secure the maximum benefit from technological change.

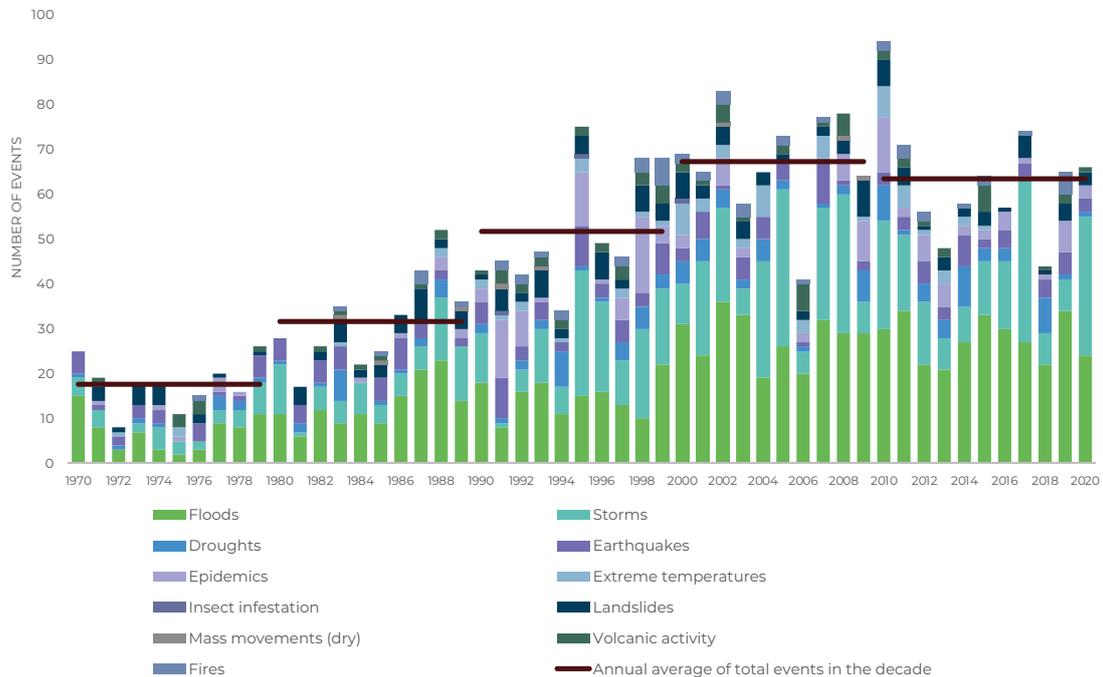
## Climate change and sustainability

Natural disasters are happening more often in Latin America and the Caribbean, and climate change is expected to intensify the frequency and scale of certain natural disasters in the region, such as hurricanes, droughts, and floods. According to data from the Center for Research on the Epidemiology of Disasters (CRED) at the Catholic University of Louvain, the frequency of natural disasters is increasing rapidly. Figure 8 shows the incidence of natural disasters in Latin America and the Caribbean between 1970 and 2020.

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<sup>8</sup>. The rise of private ride-sharing and ride-hailing passenger services, increasingly shared among several passengers, has revolutionized transportation systems. In turn, the widespread adoption of digital platforms, hyper-connectivity and the use of high-frequency data collection tools have enabled real-time process optimization, including route design and infrastructure management, as well as flexibility in logistics. This yields lower costs, as well as greater traceability, transparency, and productivity.

**Figure 8.** Natural Disasters in Latin America and the Caribbean (1970–2020)



Notes: This figure shows the annual number of natural disasters in Latin America and the Caribbean for the period 1970–2020 by type of disaster.

Source: Prepared by the authors on the basis of EM-DAT.

Natural disasters not only destroy infrastructure assets, entailing huge monetary costs. Damage and losses caused by climate events also have a form of “domino effect” on the reaction capacity and recovery efforts of local economies, while constraining potential economic growth in the medium and long terms. Given the complementarity of infrastructure services, losses and interruptions of service in one sector condition the capacity of other sectors to provide services effectively, thereby hampering the productive system’s overall capacity and amplifying the scale of the impact in time and space.<sup>9</sup>

Climate change has direct implications for the availability of resources needed to provide infrastructure services. In the water sector, for example, it is estimated that the higher incidence of climate events will help make freshwater less available and will degrade its quality (Libra et al., 2022). Greater variability in hydrological cycles poses the risk of droughts that can affect the output of large hydroelectric plants (Byers et al., 2020). Moreover, changes in wind patterns or solar exposure have direct repercussions for the intermittency of non-conventional renewable sources (that is, solar and wind energy). Natural disasters and changing climatic conditions also affect the level and geographic location of demand for electricity, water, and transportation services. Recent evidence suggests that electricity demand

<sup>9</sup> The electricity service, for example, is not only crucial in meeting basic household needs and a critical input for businesses; it is also essential in ensuring the provision of transportation and water and sanitation services.



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grows swiftly as temperatures rise (Davis and Gertler, 2015). In fact, extreme weather events such as heat waves and droughts have a substantial impact on demand for and supply of electricity and water. That circumstance could cause the saturation and collapse of available infrastructure networks during critical service delivery conditions (Byers et. Al., 2020; Hoffmann et al., 2020).

It is clear that climate change and the greater frequency of natural disasters demand modifications to sectoral regulation and governance. Meeting the targets for reducing greenhouse gas emissions and complying with climate change agreements has direct implications for the way infrastructure services are delivered. Latin American and Caribbean countries must urgently strengthen sectoral planning institutions and units to ensure that service provision meets the objective of furthering the decarbonization of the region's economies. At the same time, the greater frequency and intensity of climate events demands more resilient infrastructure. That in turn requires updating the technical designs that guarantee the provision of services in contexts of extreme climate events.

### Urbanization and rising social demands

It is a complex matter to provide infrastructure services to the middle class, especially to urban households whose socioeconomic status improves. As households' income levels rise, access is deficient. Additionally, there are demands for services to be affordable and reliable; there are demands for quality services, which are much more difficult to meet and satisfy than the simple task of providing basic access to services. The middle class has grown rapidly over the past two decades in Latin American and Caribbean countries, (De la Cruz et al., 2020). As household income increases, consumption patterns change to include goods marked by a higher consumption of infrastructure services. Recent evidence indicates that the increase in households with greater purchasing power translates into the purchase of goods that consume water and energy, such as refrigerators, air conditioners, washing machines and dryers, water pumps, automobiles, personal computers, and household appliances in general, especially in households that move out of poverty and enter the middle class (Gertler et al., 2016).

Latin America and the Caribbean is the world's most urbanized developing region. More than 80 percent of its population (about 539 million people in 2020) lives in cities and urban centers, a figure that is far above the world average (56.2 percent in 2020, according to figures reported by the World Bank).<sup>10</sup> Human agglomeration, as well as sustained population growth in urban areas, impose enormous challenges and put pressure on the provision of infrastructure services, prompting a continuous rise in demand for transportation, electricity, and water and sanitation services. Agglomeration and economies of scale in urban areas, however, also offer opportunities for more efficient infrastructure service delivery schemes. That requires coordinated policies and new regulations to incentivize the efficient provision of infrastructure services, especially in the region's fast-growing cities.

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<sup>10</sup> The urbanization rate in Latin America and the Caribbean is expected to reach 84 percent in 2030, 86 percent in 2040, and 88 percent in 2050 (ECLAC, 2019).



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Access is not enough when service provision is deficient in quality. Many of the social protests that the region has experienced in recent years reveal society's widespread dissatisfaction with the quality and cost of infrastructure services. It is not enough to have access to a modern transportation fleet if users have to travel in overcrowded conditions. It is not enough to have water at home if the lack of quality forces households to incur additional costs in order to satisfy domestic consumption (water consumption, preparation of food, and personal hygiene) (Gómez Vidal et al., 2022). It is not enough to be connected to the electricity grid if the system has persistent problems related to variations in voltage or service interruptions (Cavallo et al., 2020).

Poor service quality, however, is not the only source of frustration. Affordability or the capacity to pay for infrastructure services is not just a problem for lower-income households; it is also a problem for the region's middle class. Paying for services requires a great effort on the part of households in Latin America and the Caribbean. The region spends more on infrastructure services than any other developing region across all income groups, especially in the monthly budgets of the poorest families (Estache et al., 2018). Building a new regulatory architecture requires putting the users of infrastructure services at the center of sectoral planning, as well as involving them in policymaking and accountability processes.

## A new regulatory architecture: The path to more and better infrastructure

The infrastructure sector in Latin America and the Caribbean urgently requires institutional, regulatory, and process changes. It also needs new instruments to meet the demand for infrastructure services in terms of quantity and quality, while at the same time promoting the provision of services at affordable prices. The countries of the region must rethink the incentives framework governing the sector, and pursue a set of reforms that give rise to a new regulatory architecture. How should it change? Where to start? What policy measures could increase and improve investment in infrastructure? What is the appropriate set of reforms, institutions, and instruments to increase the quantity and quality of infrastructure services?

The answer is not simple: **There are no silver bullets!** There is no single and cross-cutting solution for the countries of the region. On the contrary, the effectiveness and scope of reforms and regulations, and the creation of new instruments, largely depend on the institutional depth and capacity of the region's countries. Countries that have weak institutions and less institutional capacity will have to move forward with reforms that are in line with the capacities of policymakers and/or the authorities, or with partial or intermediate reforms, as they advance towards far-reaching reforms. Countries with greater institutional depth and development can move forward with policy reforms and sophisticated instruments that have a greater impact.



## Reforms to Foster Sustainable and Inclusive Infrastructure

The rest of this section identifies a set of measures and proposals—including policy reforms and the creation of new instruments—geared to reactivating and increasing investment in infrastructure (**more hardware**) and the quality of services provided (**better software**). Designing, structuring, and implementing them will require the mobilization of financial and human resources, technical support, and above all a great deal of commitment and political will from the countries' policymakers and authorities.

### More hardware (more infrastructure)

- Create a national infrastructure agency with autonomy and independence. It should have a mandate to plan a portfolio of medium- and long-term projects aligned with climate goals and Nationally Determined Contributions. It should also have the capacity to conduct rigorous assessments so as to enable the selection and prioritization of infrastructure projects with the greatest impact and social return (Campos et al., 2020). Some developed countries such as Australia, Canada, and the United Kingdom have set up specialized infrastructure centers, often known as “I-bodies,” to raise efficiency throughout the infrastructure project cycle. Most I-bodies are still evolving, but they have been responsible for (i) providing greater strategic coherence to infrastructure policy; (ii) lowering political risk; (iii) offering greater certainty to stakeholders, including investors; and (iv) increasing public confidence in the provision of infrastructure services.<sup>11</sup> Most countries in Latin American and the Caribbean do not have comprehensive infrastructure plans. Where they do exist, they tend to be sectoral plans that disregard the interlinkages and interdependencies of infrastructure services (Cavallo et al., 2020). This tends to reflect the prevailing sectoralist structure in the countries of the region, where there are specific sectoral ministries but no centralized body that takes a comprehensive approach to the systemic planning of infrastructure works. Additionally, in countries where there is some kind of planning, it does not usually extend beyond the region's political cycles—so the plans are produced with the government of the day and they disregard the existence of (or consistency with) previous or ongoing plans. In this context it is imperative that the region develop plans that spring from consensus, and that are flexible enough to adapt to changing circumstances affected by technological disruptions and climate threats. In this regard, there is an urgent need to strengthen countries' capacities to plan and implement mitigation measures in a systematic and measurable way (Morillo Carillo et al., 2019). Infrastructure plans will only be credible if the projects they propose can be implemented in a reasonable timeframe and without cost overruns. Moreover, the creation of national infrastructure agencies in Latin American and Caribbean countries requires substantive changes in local legislation and new regulations that make their operations feasible. Clearly this is no simple task, but it is a necessary one. Countries also have to make progress on strengthening national public investment systems. These bodies

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<sup>11</sup> A detailed description of I-bodies and their main functions can be found in Cavallo et al. (2020).



## Reforms to Foster Sustainable and Inclusive Infrastructure

are normally part of the ministries of economy and finance, and they play a fundamental role in the budgetary allocation cycle, regulatory harmonization, prioritization, and the operational decentralization of infrastructure projects.<sup>12</sup>

- Foster the development of infrastructure as an asset class for private investment, in part by devising reforms that facilitate the participation of institutional investors (particularly pension funds, investment funds, and insurance companies) in the financing of infrastructure projects (Alvarez et al., 2022; Serebrisky et al., 2015). Among other things, that requires the improvement and updating of regulatory frameworks, tax systems, local legislation and accounting arrangements, as well as greater depth in the capital market. Many countries in the region have very underdeveloped capital markets, a circumstance that hampers the private financing of infrastructure projects. With some exceptions, the large majority of the region's commercial banks lack the lending space to devote their portfolios to infrastructure projects.<sup>13</sup> Deep financial markets are crucial if infrastructure is to become an asset class. Only developed financial markets with sophisticated portfolios of investment instruments allow trading in these kinds of assets.
- Hasten the development of new instruments for risk mitigation and management in infrastructure projects. Such projects, being large and illiquid, are the most difficult to appraise and structure. The decision to invest in a specific project depends on the assessment of project risks and the availability of instruments to mitigate or manage those risks, including currency risk insurance and guarantee and hedging instruments. The risk profile of projects changes throughout their life cycle, and financial vehicles should be developed with that consideration in mind. In that regard, an appropriate diversification of financial instruments provides a variety of tools that have the potential to reduce the risk of infrastructure assets. The countries of the region will have to work on the standardization, replicability, and scalability of the instruments, and on ensuring that they are fully understood by the market, rather than focusing on custom-made products (Alvarez et al., 2022; Serebrisky et al., 2015).
- Develop asset recycling strategies. One tool to attract additional private investment to the infrastructure sector is to design asset recycling schemes (Serebrisky et al., 2020). Recycling existing assets makes it possible to meet two goals simultaneously: **(i)** attract private capital to investment alternatives with less risk; and **(ii)** secure extraordinary fiscal resources to finance new infrastructure projects. Attracting private capital to assets in operation (“brownfield” infrastructure) may be

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<sup>12</sup>. Several countries in Latin America and the Caribbean have created National Public Investment Systems (SNIPs, from their full term in Spanish), including Argentina, Bolivia, Chile, Colombia, Costa Rica, the Dominican Republic, Ecuador, El Salvador, Guatemala, Honduras, Mexico, Nicaragua, Panama, Paraguay, Peru, and Uruguay. The Economic Commission for Latin America and the Caribbean (ECLAC) has set up a portal dedicated to SNIPs. It includes links to the national websites, as well as documents that assess the performance of these systems (<https://biblioguias.cepal.org/c.php?g=159547&p=1044441>).

<sup>13</sup>. The two exceptions in the region are Chile and Mexico.



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preferred by private actors because such assets may have a lower risk profile (demand is known and there are no construction risks), in contrast to building new projects (“greenfield” infrastructure). Developing these kinds of initiatives allows the public sector to monetize underused assets, and simultaneously to save on costs associated with management of the assets, thereby boosting the financing capacity of new projects. In any case, an asset recycling strategy will ultimately depend on the willingness of policymakers to guarantee funding, preferably through end-user charges. This can be a tough proposition in some circumstances, because it reduces users’ disposable income.

- The countries of the region must make progress on devising and/or modifying fiscal rules that make it possible to protect investment and maintenance spending for infrastructure projects, especially at times of reduced revenues and fiscal consolidation (Campos et al., 2020). Countries of the region face an urgent need to devise structural fiscal spending rules that enable them to reverse the bias against investment in public infrastructure.
- Enhance the design of policies that promote environmental and social sustainability in the infrastructure sector (Bhattacharya et al., 2019; Thacker et al., 2021). This includes (i) decarbonizing built infrastructure and the services it supports through integrated systems planning; (ii) incorporating elements of climate resilience into the early stages of planning and development processes; and (iii) ensuring that new assets take into account and are planned in line with the principles of the circular economy and waste reduction.
- Promote and include climate goals in the planning of new infrastructure projects, including the determination and pricing of externalities associated with carbon emissions. In other words, the countries of the region must develop schemes for infrastructure service provision that are consistent with a carbon-neutral footprint. Currently, there is no coordination between the region’s energy, climate, and fiscal goals. That circumstance hinders an orderly process of decarbonization and energy transition in the countries of Latin America and the Caribbean (IDB, 2021). One tool available to the region’s countries is to develop what are commonly termed “decarbonization plans” or “long-term strategies” that establish a roadmap for the sectoral investments and policy reforms required for a just transition (Vogt-Schilb et al., 2020).
- Devise sectoral strategies for the risk management of stranded assets in order to facilitate the transition to low-carbon economies, including the introduction of offsetting policies to support affected sectors and communities (IDB, 2021).
- Design policies geared to promoting competition and transparency in the infrastructure sector, including the assignment of all contracts to build infrastructure projects or manage services through competitive schemes—that is, international tenders (Campos et al., 2020).



### ...and better software (better service provision)

- Encourage the development of public-private partnerships (PPPs)<sup>14</sup> by strengthening laws, introducing new institutional arrangements, and creating PPP units (Suarez-Aleman et al., 2021). PPPs have the potential to improve sectoral performance through efficiency gains and innovation (thanks to better asset planning, development, and maintenance), and through a closer alignment of incentives and risk sharing.<sup>15</sup> The countries of the region have made great efforts to further the development of their infrastructure sectors, but there are still significant shortcomings in current structuring capacity and the required investment climate (Cavallo et al., 2020). Among other matters, moreover, the countries of Latin America and the Caribbean need to move further in creating and/or strengthening oversight bodies for PPP development; these should be staffed by specialized personnel and should enable a balanced sharing of risks and costs among the actors. PPPs entail a more sophisticated governance than is usual in traditional public infrastructure provision. Successful PPPs require government institutions that have the capacity to plan and execute projects, follow up on contracts, and enforce compliance with those contracts, including the design of a penalty mechanism for non-compliance.
- Strengthen technical capacities for contracting, monitoring and oversight in infrastructure projects, including the creation of a data agency or establishing specialized teams within infrastructure provision agencies with responsibility for collecting, publishing, and analyzing data. Similarly, there is an urgent need for specialized teams with the capacity to conduct ex post assessments, not only as an instrument for evaluation and oversight, but also as a continuous learning tool to inform future decision-making (Suárez-Aleman et al., 2021).
- Design and define new tariff schemes and quality standards, including the designation (or reallocation) of new responsibilities among regulators and competition agencies. Innovations and technological development require the transformation of the tariff structure for infrastructure services. In the electricity sector, for example, technological disruptions make the current price-formation mechanism unsustainable in most Latin American and Caribbean countries. Progress must be made on designing dynamic

<sup>14</sup>. A conventional PPP usually bundles the financing, construction, and/or provision of a service into a long-term contract (typically 25–30 years) between the public procurement authority and an independent private company (Engel and Galetovic, 2014). This contrasts with the traditional form of public procurement, whereby projects are financed through debt issuance or public budget appropriations—processes that are then taken over by a public institution that contracts the builder and operator.

<sup>15</sup>. Additionally, PPP schemes could improve sectoral performance by mobilizing additional financing that allows the public sector to undertake projects that could not have been financed or undertaken conventionally. It is important to note, however, that PPPs are not a vehicle for obtaining financing outside the public sector balance sheet. There is an intertemporal decision in the government budget, wherein the “savings” from disbursement of the initial investment are linked to future tariffs (end-user charges), future tax revenues, debt issuance, or direct payments from public funds.



tariff structures that provide consumers with real-time information on the costs, externalities, and opportunities associated with the time, place, and source of electricity generation (Hallack et al., 2020). Table 2 illustrates some of the changes required in the electricity-pricing structure in Latin American and Caribbean countries.

**Table 2.** Transforming the Tariff Structure in the Electricity Sector

	Current tariffs	Future tariffs
<b>Charges that do not depend on the electricity consumed</b>	<ul style="list-style-type: none"> <li>They account for a small part of the electricity bill. When included on the bill, the charge is not related to the cost characteristics of the service supply (for example, to the maximum capacity of the household's system).</li> </ul>	<ul style="list-style-type: none"> <li>They account for a substantial part of the electricity bill. A fixed charge is set to reflect the cost structure of the electricity supply. Different cost factors should be set separately; and adequate information on their level and changes should be transparent: for example, the right to use the grid, the right to market electricity using the grid, insurance services.</li> </ul>
<b>Charges that depend on the electricity consumed</b>	<ul style="list-style-type: none"> <li>They account for almost the entire electricity bill. They are set to provide sufficient revenue to the utility, so as to cover long-term variable and fixed costs. They distinguish among users (for instance, rural vs. urban, residential vs. industrial) with the aim of meeting equity and affordability goals (cross-subsidies).</li> </ul>	<ul style="list-style-type: none"> <li>They account for a small part of the electricity bill. There is greater "granularity" of prices. They reflect the marginal cost of providing services at the time and place where the services are consumed. Prices are set exclusively to meet efficiency targets; affordability targets are addressed with other instruments.</li> </ul>
<b>Sectoral taxes and charges</b>	<ul style="list-style-type: none"> <li>They can account for a significant portion of total bills. An instrument to meet policy objectives that often extend beyond the electricity sector (for example, to help finance general fiscal revenues).</li> </ul>	<ul style="list-style-type: none"> <li>Taxes and sectoral charges should not distort the principle that prices should always reflect the costs of the service.</li> </ul>
<b>Subsidies</b>	<ul style="list-style-type: none"> <li>Subsidies to meet equity objectives are mainly financed using cross-subsidies. Mainly set as electricity price discounts.</li> </ul>	<ul style="list-style-type: none"> <li>Subsidies to meet equity objectives are funded from general fiscal revenues. Set primarily as discounts from the fixed charge on the electricity bill.</li> </ul>

Source: Hallack et al., 2020.



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- Review and update general subsidy policies. Subsidies policies can be regarded as a redistribution mechanism (increasing access and/or ensuring minimum consumption), but in most cases they end up being inefficient and regressive. For example, it is estimated that energy subsidies in Latin America and the Caribbean amounted to an average of US\$ 399 billion per year (equivalent to 9 percent of regional GDP for 2020) during the period 2015–2020 (Parry et al., 2021). In the water sector, the region's subsidy rate is more than 2 percent of GDP a year, including operating subsidies and capital expenditures (Andres et al., 2019). Nonetheless, recent empirical work has estimated that more than two-thirds of subsidies in the infrastructure sector are poorly targeted or leak to non-poor households in the region (Cavallo and Serebrisky, 2016; Andres et al., 2019). Apart from the fiscal burden and the distributional implications, keeping energy prices artificially low fosters inefficiencies in the optimal consumption level and hinders the adoption of new technologies (Balza et al., 2016). The region should transition towards targeted subsidy schemes based on income conditions, and with a predictable source of financing (Cont and Navajas, 2019).
- Create centralized oversight mechanisms (for example, through a holding company with independent directors and explicit governance codes) to monitor and oversee the performance of state-owned enterprises. The financial performance of state-owned enterprises in Latin America and the Caribbean tends to be inferior to that of their private-sector peers, reflecting poor governance or the use of clientelist practices linked to short-term partisan political priorities (Musacchio and Pineda Ayerbe, 2019). Transparency in determining goals and performance indicators could be crucial in improving the companies' financial management and in reducing corruption in state-owned enterprises.
- Promote the creation and publication of registries with information on beneficial ownership<sup>16</sup> in infrastructure projects. Identifying beneficial owners serves to prevent illicit activities, facilitate tax collection, and promote transparency (IDB and OECD, 2019).
- Pursue the updating of regulatory frameworks that promote transparency and integrity in the infrastructure sector. This should include reforms and actions geared to minimizing and preventing conflicts of interest, and to improving cooperation and coordination mechanisms among agencies responsible for detecting and penalizing fraud and corruption. Special attention should be paid to the relationship between the national and subnational levels, and relative capacity to implement consistent reforms at all levels of government. One tool for countries in the region to consider could be the regional adoption of the Principles of Transparency and Integrity in Infrastructure. The Inter-American Development Bank has moved forward with an initiative to develop those principles, which cover the main integrity risks throughout the infrastructure project cycle, providing institutional, legal, and financial standards to be adopted by governments, public and private banks, multilaterals, and other stakeholders (IDB, 2022).

<sup>16</sup> The concept of beneficial owner is used here to refer to individuals who exercise effective control or who benefit economically from a legal vehicle (such as a corporation, a trust, a foundation) associated with a given project.



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- Devise integrity pacts to strengthen and facilitate the role of civil society in the oversight of infrastructure works, providing it with detailed information and tools to act preventively and inform citizens in a timely manner (Campos et al., 2020). Citizens must be given technology tools such as web platforms, mobile applications, and data visualizations for different users in a unified and intuitive format. An example of this is the [InvestmentMap<sup>17</sup>](#) initiative, which enables governments to inform citizens about public investments and make inter-jurisdictional comparisons of the efficiency and management of public spending in real time. Recent evidence has revealed links between an improvement in the physical and financial performance of public investment projects, on the one hand, and the presence of active citizen monitoring and control platforms, on the other (Rossi et al., 2020).
- Design policies and create new tools geared to furthering the adoption and use of new technologies in the provision of infrastructure services, including the design and rapid deployment of plans for digital transformation and digital literacy in the sector. The speed of technological change demands the provision of sandboxes, soft law mechanisms, self-regulation, proof of concept banks, and channels for regulatory experimentation to test innovative standards and new technologies that enable the adoption of a dynamic and adaptive regulatory model (Sanin and Hallack, 2021; Calatayud and Muñoz, 2020). The swift pace of technological change makes it unfeasible to devise a traditional form of regulation based on rules that are changed through long processes in fixed periods. Rather, it requires a spectrum of regulatory practices to ensure that regulation is credible, as well as adaptive and iterative through a process of continuous learning (Hallack et al., 2020). Moreover, the countries of the region must make progress on strengthening the information and communication technology (ICT) capacities of public agencies and regulatory bodies; on developing financial and non-financial incentives for the adoption of new technologies; and on updating public procurement systems in the infrastructure sector (Calatayud et al., 2022b).
- Demand that technological requirements and digitalization plans be included in the mechanisms and systems used to evaluate proposals for public procurement programs (Calatayud et al., 2022a). It is imperative to use the public procurement process to stimulate the adoption of technologies in the construction phases of infrastructure, as well as in the provision of services provided through it.

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<sup>17</sup> InvestmentMap is an Inter-American Development Bank initiative to link up and implement virtual platforms for information management (including data visualizations and georeferenced maps) on public investment projects. These allow citizens to monitor, in real time, how and where the governments of the countries of the region invest.



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- Introduce intervention instruments geared to changing the behavior of end-users and consumers. For example, consumers can react to “nudges” or incentives that include pricing schemes, information campaigns, and conditional transfers, among other possibilities. Behavioral economics has focused mainly on reducing the consumption of infrastructure services and inculcating conservation habits; fostering investment in more technologically advanced equipment; and encouraging the provision of public goods, including environmental conservation (Sanin et al., 2019). Recent empirical evidence for Latin America and the Caribbean suggests that information campaigns can be effective in influencing the level of consumption of infrastructure services (Datta et al., 2015) and the degree to which reforms to subsidy schemes are accepted (Vieites et al., 2022). In that regard, behavioral economics can improve the tools available to policymakers, with a view to upgrading both the effectiveness of regulation and the provision of infrastructure services (Joseph et al., 2021; Cavallo et al., 2020).



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