EPPUR SI MUOVE: THE EVOLUTION OF INFRASTRUCTURE GAPS IN LAC, 2021–2026

Juan Pablo Brichetti
Eduardo Cavallo
Diego Pitetti
Carlos León-Gómez

EPPUR SI MUOVE: THE EVOLUTION OF INFRASTRUCTURE GAPS IN LAC 2021–2026

Juan Pablo Brichetti
Eduardo Cavallo
Diego Pitetti
Carlos León-Gómez[1]

1 The authors would like to thank Lisa Bagnoli (IDB), Priscila Stisman (IDB), María Eugenia Rivas (IDB), and Daniel Perrotti (ECLAC) for their valuable comments and suggestions, which undoubtedly added depth and provided essential guidance for carrying out this work. Any opinions, errors, or omissions are the sole responsibility of the authors.

IDB

Eppur Si Muove: The Evolution of Infrastructure Gaps in LAC, 2021–2026

Keywords: infrastructure gap, Latin America and the Caribbean, Sustainable Development Goals (SDGs), investment, water, sanitation, electricity, transport, and telecommunications.

JEL Codes: N76, O18, H54, Q01, L92, L93, L94, L95, L96.

Design and Layout: Natalie Ponce Hornos (www.copoestudio.com)

CONTENTS

Executive Summary 7

CHAPTER 1 Introduction 14

CHAPTER 2 Update on the Infrastructure Gap in LAC to Achieve the SDGs by 2030 18

Electricity 23
Water and Sanitation 26
Safely Managed Water 26
Safely Managed Sanitation 28
Telecommunications 31
Fixed Broadband 31
4G Networks 36
Transportation 38
Road Transportation 38
Air Transportation 45
Electromobility 47

CHAPTER 3 Infrastructure Investments in LAC During the 2015–2023 Period 48

CHAPTER 4 Discrepancies Regarding Investment Data 52

Measuring Infrastructure Investment 58
Limitations in Measuring Public Investment in LAC 59
Limitations in Measuring Private Investment in LAC 61

CONTENTS

Concluding Remarks 68

References 70

ANNEX

Methodology for Calculating the Infrastructure Gap in Latin America and the Caribbean 74

A. General Aspects 75
- A.1. Demographic Estimates 75
- A.2. GDP Projections 78
- A.3. General aspects of calculating investment in the maintenance and replacement of assets 79

B. Calculation of the Infrastructure Gap in the Electricity Sector 79
- B.1. Calculation of the Electricity Access Gap 79
- B.2. Calculation of the Electricity Generation and Transmission Gap 82

C. Calculation of the Infrastructure Gap in the Drinking Water and Sanitation Sector 85
- C.1. Calculation of the infrastructure gap for access to safely managed drinking water 86
- C.2. Calculation of the Gap in Access to Safely Managed Sanitation 88
- C.3. Calculation of the wastewater treatment gap 91

D. Calculation of the Infrastructure Gap in the Telecommunications Sector .. 93
- D.1. Calculation of the Gap in Access to Telecommunications Services 93

E. Calculation of the Infrastructure Gap in the Transportation Sector 97
- E.1. Calculation of the Infrastructure Gap in Rural Population Access to the Road Network 98
- E.2. Calculation of the Infrastructure Gap for Providing Adequate Logistics 101
- E.3. Calculation of the Infrastructure Gap for Providing Adequate Urban Mobility 102

F. Consolidated Results and Availability of Information by Country 106

LIST OF FIGURES

FIGURE 1. Total investment required to close the identified gaps over the 2025–2030 period (in millions of US dollars) and annual investment as a percentage of GDP by sector 21
FIGURE 2. Investment needs as a percentage of regional GDP by infrastructure sector. Comparison between original and updated estimates 22
FIGURE 3. Projected and observed electricity coverage rates in Latin America and the Caribbean, 2018–2030. In percentages 24
FIGURE 4. Electricity: projected and observed coverage by country, 2023. In percentages 26
FIGURE 5. Percentage of safe water supply coverage in Latin America and the Caribbean, 2018–2030. In percentages 27
FIGURE 6. Safely managed water: projected and observed coverage by country, 2024. In percentages 28
FIGURE 7. Percentage of coverage for safely managed sanitation in Latin America and the Caribbean, 2018–2030. In percentages 30
FIGURE 8. Safely managed sanitation: projected and observed coverage by country, 2024. In percentages 31
FIGURE 9. Fixed broadband coverage in Latin America and the Caribbean, 2018–2030. In number of subscribers per 100 inhabitants 32
FIGURE 10. Fixed broadband: projected and observed coverage by country, 2024. In number of subscribers per 100 inhabitants 33
FIGURE 11. Percentage of 4G network coverage in Latin America and the Caribbean, 2018–2030. In percentages 36
FIGURE 12. 4G networks: projected and observed coverage by country, 2024. In percentages 37
FIGURE 13. Number of paved kilometers in Latin America and the Caribbean, 2018–2030. In kilometers. 38
FIGURE 14. Paved kilometers: projected and observed coverage by country, 2023. In thousands of kilometers 40
FIGURE 15. Unpaved kilometers: projected and observed coverage by country, 2023. In thousands of kilometers 41
FIGURE 16. Number of kilometers of highways in Latin America and the Caribbean, 2018–2030. In kilometers 42
FIGURE 17. Highways: projected and observed coverage by country, year 2023. In kilometers 43
FIGURE 18. Infrastructure investment needs in Latin America and the Caribbean as a percentage of regional GDP. Comparison between estimated gaps and annual public, private, and total investment 49
FIGURE 19. Infrastructure investment needs by country. Comparison with average investment for 2015–2023 as a percentage of GDP 50
FIGURE 20. Infrastructure investment needs in Latin America and the Caribbean by infrastructure sector. Comparison with average public investment for 2019–2023 as a percentage of GDP 51
FIGURE 21. Contribution of factors to the estimated reduction in the infrastructure investment gap in Latin America and the Caribbean. In millions of dollars and as percentages 56
FIGURE 22. Infrastructure classification by type 58

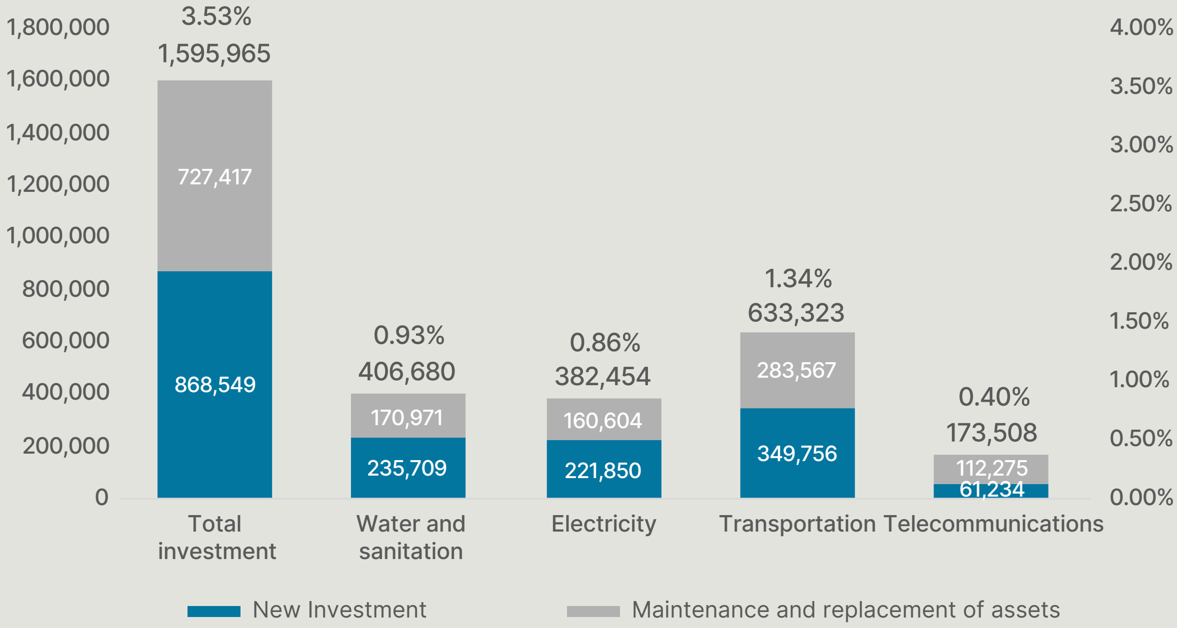
Executive Summary

In the study “The Infrastructure Gap in Latin America and the Caribbean: Investment Needed Through 2030 to Meet the Sustainable Development Goals” (Brichetti et al., 2021), the Inter-American Development Bank (IDB) estimated for the first time, in a methodologically consistent and cross-sectoral manner, the level of investment that Latin America and the Caribbean (LAC) would need to mobilize to advance toward meeting the infrastructure targets associated with the Sustainable Development Goals (SDGs) by 2030. Although these targets are not legally binding, they constitute a widely recognized international benchmark for the levels of coverage and quality expected to be achieved in key sectors such as water and sanitation, electricity, telecommunications, and transportation.

Since nearly five years have passed since these initial estimates were made, it is necessary to conduct a review to assess the progress made by countries in the region toward achieving the SDGs related to infrastructure sectors. This document updates those estimates using the latest available data (primarily from 2024) with the primary aim of evaluating this progress.

The results of this analysis indicate that the region has made progress—in some cases significant—toward the established goals; however, this progress is insufficient to achieve the SDGs on time and in the required manner. The new estimates indicate that the region would need to increase its annual investment levels to 3.53% of its GDP for the 2025–2030 period if it intends to achieve the SDGs by 2030. This figure represents a 13% increase over the estimates by Brichetti et al. (2021), which indicated that the region needed to invest 3.12% of its GDP to achieve the same goals. The main investments needed are in the transportation sector, which accounts for 40% of the identified gap, followed by the water and sanitation (25%), electricity (24%), and telecommunications (11%) sectors.

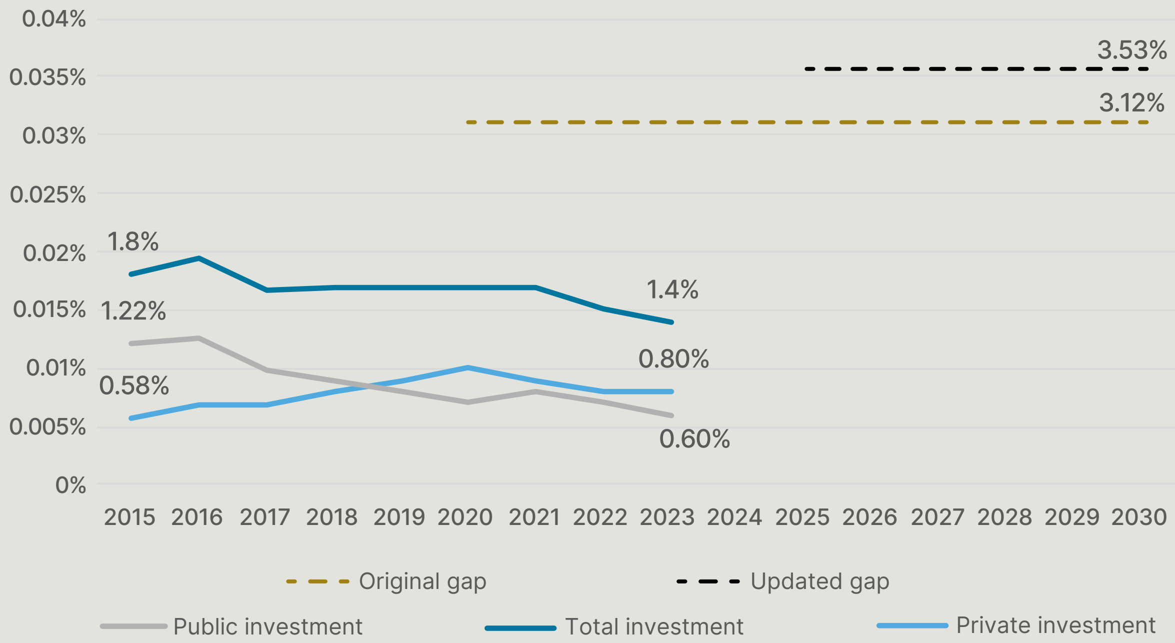
Figure ES. 1. *Total investment required to close the identified gaps over the 2025–2030 period (in millions of US dollars) and annual investment as a percentage of GDP by sector.*



Source: Author's own calculations.

The increase in annual investment needs for the 2025–2030 period required to achieve the SDGs is not surprising when one considers that the region's actual levels of infrastructure investment during the 2015–2023 period were significantly below the needs originally estimated by Brichetti et al. (2021). For the period 2015–2023, infrastructure investments in LAC averaged 1.7% of GDP per year, well below the identified needs. This situation is further exacerbated by a downward trend in investment, primarily driven by a decline of more than 50% in public investment.

Figure ES. 2. *Comparison of estimated investment needs with annual public, private, and total investment in LAC*



Source: Author's own calculations based on Brichetti et al. (2021).

However, what is surprising is that the degree of progress toward achieving the SDGs, as measured by the coverage and qualitative indicators surveyed, is greater than expected given the actual levels of public and private investment observed. Understanding the reasons for this divergence has become a top-priority public policy objective. While there are known factors that may partially explain these differences—such as a marked reduction in population growth rates and divergences in the growth rates of the region's economies compared to those assumed in the original analysis—these explanations are quantitatively insufficient.

In particular, given the observed behavior, two main alternative hypotheses—which are not mutually exclusive—initially emerge: either the original estimates overestimated the investment needs required to achieve the SDGs, or investment levels in the region's infrastructure sectors are underestimated.

While it is not possible to definitively rule out the possibility that the originally estimated investment needs are overestimated, multiple lines of evidence indicate that this hypothesis is not the primary explanatory factor. First, the estimates in the original study were made using a conservative approach with regard to the unit costs applied to close the gaps. Furthermore, when updating the analysis—using newly available information—no significant differences were detected between the actual unit costs used and the costs used in the original analysis. Second, the unit costs applied were those considered theoretically efficient; therefore, when accounting for the inefficiencies typically observed in infrastructure projects in practice (cost overruns, delays, etc.), it is expected that the investment needs to close the gaps are underestimated rather than overestimated. Finally, the estimated investment needs did not account for the full scope of infrastructure investments that countries must undertake, both because certain subsectors were not included (water projects, storm drains, for example) and because, within the included sectors, there were ancillary projects that had not been valued (for example, investments related to the road network such as highway access roads, improved port access, etc.). Given that the observed infrastructure investments include all investments made, it is to be expected that progress in the reported coverage and quality indicators will be lower than anticipated because part of these investments was directed toward investment needs not included in the original analysis.

Consequently, evaluating the hypothesis that infrastructure investment is underestimated is essential to assessing the likelihood that LAC will achieve the SDGs on time and as planned. There are multiple ways in which this hypothesis could hold true. First, estimating public infrastructure investment requires cross-referencing budget data based on economic classification and by purpose and function. Since there is no specific identifier for infrastructure investment in public accounts, it is possible that public investments affecting coverage and quality indicators are underestimated. In particular, spending on infrastructure maintenance is often classified as current expenditure or is not properly identified, so the criteria typically used to estimate public investment do not account for it.

Another source of underestimation of public investment in the region is the difficulty in identifying investments made at the subnational levels of government, particularly in the region's federal countries. Budget execution reports that consolidate all levels of government are scarce and, in many cases, do not facilitate the identification of specific expenditure items, such as capital expenditures directed toward specific infrastructure sectors. Furthermore, in some infrastructure subsectors, a significant portion of investments is made through public enterprises, whose expenditure data is often not properly incorporated into consolidated reports.

The situation regarding the reporting of private infrastructure investments is no better. The sources typically used to estimate private infrastructure investments are largely skewed toward reporting investments made through *project finance* instruments and large-scale projects. In other words, these databases primarily focus not on private infrastructure investment itself, but on its financing.

As a result, investments funded by users or by infrastructure service concessionaires are rarely included in these estimates. However, there are certain cases in which private investments can affect coverage indicators, particularly when they generate assets that, although developed by private entities, ultimately become integrated into or linked with public networks. Examples of this include the construction of roads linked to productive activities that can later be used by other users, or individual solutions for the provision of basic services. In any case, the magnitude of these self-provided investments is difficult to quantify with the available sources and constitutes one of the channels that could help explain the divergence between observed progress and reported investment.

Addressing these shortcomings in the measurement of infrastructure investment is therefore an important task for understanding the evolution of infrastructure gaps in the region. Closing this information gap requires progress in developing new measurement mechanisms. Among these, the following stand out: the incorporation of specific infrastructure investment identifiers into public accounts; the development of infrastructure satellite accounts within the framework of national accounts; and the creation of private investment databases that are not limited to project financing but also incorporate capital investments made by both concessionaires and the service users themselves. Making progress on this agenda is essential for improving the quality of analysis and strengthening decision-making regarding infrastructure in the region.

This need for improved measurement, however, addresses only one of the possible explanations of the divergence—the underreporting of investment—while the divergence also responds to other factors, such as the lags between investment and the maturation of works or the reduction in the cost of closing each unit of the gap, resulting from more affordable technological solutions and lower demographic pressure. Discerning the relative weight of each of these factors is an open question and a first-order policy objective.

Existing estimates indicate that, given the reported levels of investment, Latin America and the Caribbean would not be in a position to close the identified infrastructure gaps. It is therefore essential to compare these predictions with the observed empirical evidence. The history of scientific thought reminds us that, even when evidence contradicts dominant conceptual frameworks, its validity does not disappear as a result. In this regard, the data compiled in this study show that, despite investment levels that appear to be lower than those estimated as necessary, the region is making real—albeit insufficient—progress on several of the coverage and quality indicators considered. As Galileo Galilei is said to have remarked when acknowledging the primacy of empirical evidence over the dogmas of his time, "*eppur si muove*." The region is making progress, and understanding why it is doing so is a central issue for the design of public policies.

Abbreviations

LAC	*Latin America and the Caribbean*
IDB	*Inter-American Development Bank*
MDBs	*Multilateral Development Banks*
IMF	*International Monetary Fund*
SDGs	*Sustainable Development Goals*
GDP	*Gross Domestic Product*
PPP	*Public-Private Partnerships*

CHAPTER 1

Introduction

The study "The Infrastructure Gap in Latin America and the Caribbean: Investment Needed Through 2030 to Meet the Sustainable Development Goals" (Brichetti et al., 2021) estimated the level of investment that Latin America and the Caribbean (LAC) would need to mobilize to make progress toward meeting the infrastructure targets associated with the Sustainable Development Goals (SDGs) by 2030.[1] Although these targets are not legally binding, they constitute a widely recognized international benchmark for the levels of coverage and quality expected to be achieved in key sectors such as water and sanitation, electricity, telecommunications, and transportation.

In line with this approach, recent international literature has developed various multisectoral exercises aimed at quantifying the infrastructure investment needs required to close gaps in access to and quality of services. Methodologically, these exercises follow two main approaches. The first, of a top-down or benchmarking nature, derives required investment from the historical relationship between infrastructure and income (Fay and Yepes, 2003), in line with the literature on infrastructure and growth (Rozas and Sánchez, 2004; Calderón and Servén, 2004; Straub, 2008). For Latin America and the Caribbean, Perrotti and Sánchez (2011) updated this model, adjusting it for the recent behavior of investment. The second, of a bottom-up nature, estimates in a disaggregated manner the cost of achieving explicit service targets—such as those associated with the SDGs—(Briceño-Garmendia and Foster, 2009; Schmidt-Traub, 2015). Within this second strand is *Beyond the Gap* (Rozenberg and Fay, 2019), which proposes a global framework for estimating the resources needed to advance toward service targets in key sectors in low- and middle-income countries. More recently, studies such as *Banking on Cities* (World Bank, 2025a) have expanded this agenda by analyzing urban investment needs within integrated frameworks of sustainability, climate resilience, and decarbonization, with a strong emphasis on cities and low-carbon technologies, and a long-term horizon (2050). These contributions help contextualize the magnitude of the infrastructure challenge and the main cross-cutting trends across sectors.

At the same time, there is a vast body of sector-specific literature that develops methodologies to estimate investment requirements based on the technical characteristics of each sector. In water and sanitation, the works of Hutton and Varughese (2016, 2020), as well as Hutton (2024), stand out; these move beyond the quantification of costs to achieve access targets toward frameworks that incorporate service sustainability and climate resilience, and the recent IDB document for Latin America and the

1 The estimated investments represent a lower bound of total requirements, as they do not include the additional costs associated with complementary policies on affordability, resilience, and environmental sustainability.

Caribbean (Lentini, forthcoming), which delves deeper into the sanitation sector by incorporating economies of scale and complementary costs into the calculations. In the electricity sector, Galindo et al. (2022) analyze the investment requirements associated with the energy transition in the region, combining macroeconomic and energy scenarios. In transportation, the work of the International Transport Forum, including the Urban Passenger Model (ITF, 2023a) and the Modelling Framework (ITF, 2023b), provides integrated modeling tools to project the evolution of demand, fleets, congestion, and emissions under different policy scenarios. In telecommunications, the sector is primarily addressed within *Banking on Cities* from an urban and functional perspective, with a focus on the expansion and modernization of digital networks (World Bank, 2025a; World Bank, 2025b).

Within this framework, this document revisits and updates the analysis by Brichetti et al. (2021) to assess the region's recent progress toward the trajectories needed to achieve the SDGs for infrastructure and to re-estimate the associated investment needs. Based on this document, projected coverage trajectories by infrastructure sector were derived, constructed by taking the coverage level observed in 2018 and extrapolating it year by year through the sum of the initial capital stock and projected new investment, in order to achieve the targets established in the SDGs by 2030. This exercise was applied to each sector and country in the region, resulting in a convex curve showing projected coverage between 2018 and 2030, as it assumed a constant investment effort as a proportion of Gross Domestic Product (GDP) and an average annual economic growth rate of 2.2%, in accordance with the World Economic Outlook (April 2025) for LAC.[2]

Since nearly five years have passed since these initial estimates were made, it is necessary to conduct a methodologically consistent review to assess the progress made by countries in the region toward achieving the SDGs related to the infrastructure sectors. On that basis, this document updates investment needs using data from the most recent year for which information is available—2023 for electricity and transportation, and 2024 for telecommunications and water and sanitation—and compares the updated coverage data with the projected value for that same year in the original 2018 scenario. This comparison allows for a direct assessment of whether the region is ahead of, in line with, or behind the expected trajectory, and helps gauge the scale of the additional investment efforts needed to achieve the targets set for 2030.

The methodology used to update the estimates—detailed in Annex I—is

2 As a result, initial progress in terms of coverage is more moderate but accelerates toward the end of the decade, driven by projected economic growth.

consistent with the *bottom-up* and modular approach used in Brichetti et al. (2021), and the original targets and compliance deadlines have been retained to facilitate comparison. The most significant changes in this regard focus on updating the coverage and quality indicators based on the most recent available data and on updating unit costs based on observed inflation and new information.

The availability of two methodologically comparable estimates of the infrastructure gap in LAC, separated by five years, allows for an analysis of its evolution over time. Direct empirical observation of the evolution of the surveyed coverage and quality indicators also allows for comparison with the results expected based on data from associated indirect sources, such as investment indicators in the region for each of the analyzed subsectors.

In this regard, a key finding of this study is that the evolution of the gap observed in the coverage and quality indicators diverges from the expected trend based on infrastructure investment levels in LAC. Although the levels of public and private investment reported by various sources have been consistently and significantly lower than the levels needed to close the identified gaps, the indicators suggest that there has been progress—albeit insufficient to achieve the SDGs on time—in the coverage and quality of services in the region. Understanding the possible causes of these discrepancies is a top priority when it comes to discussing public policies aimed at achieving the infrastructure-related SDGs in the region—a discussion that warrants a direct and candid examination of the available sources of information—and their limitations.

This document therefore seeks to provide evidence both on the evolution of infrastructure gaps in LAC during the 2019–2024 period and on the possible causes of the divergences observed between the region's actual progress and what would be expected based on its apparent investment performance. To this end, it combines an update of the estimates of infrastructure gaps necessary to achieve the SDGs by 2030 with an analysis of recent trends in infrastructure investment and the limitations of the sources available for measuring it. To carry out this task, this document is structured into five sections, with this introduction being the first. Section 2 will focus on presenting the results of the data update exercise that forms the basis for the estimates of infrastructure gaps in the region and on comparing them with previous results. Section 3 will focus on comparing the gap results with the levels of infrastructure investment observed in the region, documenting the aforementioned divergence. Section 4 will discuss the potential causes of the observed divergences and propose some alternatives to mitigate the limitations of current data sources. Finally, Section 5 will conclude the document with some reflections and final comments.

CHAPTER 2

Update on the Infrastructure Gap in LAC to Achieve the SDGs by 2030

Electricity
Water and Sanitation
Telecommunications
Transportation

The primary objective of updating the infrastructure gap estimates published by the IDB in 2021 is to compare the most recent observed situation regarding indicators of infrastructure service coverage and quality with the originally projected trajectories, and to assess the extent to which the region is on track, lagging behind, or ahead of the expected path toward achieving the Sustainable Development Goals by 2030. In particular, the focus is on determining whether the progress observed between 2019 and 2024 corresponds to the progress implied by the originally projected trajectory, or whether, on the contrary, there are systematic deviations indicating performance that is better or worse than expected. This perspective is particularly relevant in a context where observed levels of infrastructure investment have fallen short of those required according to the original estimates, as will be discussed in greater detail in Section 3. In turn, to correctly interpret these trajectories, it is necessary to take into account the time lags between investment made and the actual availability of new infrastructure (see Box 1).

Box 1.

Investment Flow and Stock Accumulation: The Role of Time Lags

The comparison between estimated investment needs and the observed evolution of infrastructure access gaps raises an important methodological issue: the relationship between the annual investment flow and the stock of infrastructure that is actually available. In particular, while investment is recorded as a continuous flow, the stock only increases when projects are completed and begin operating, which introduces time lags between the execution of spending and its reflection in coverage or access indicators.

From an operational standpoint, the assumption that investment made in period t becomes usable capital stock in t+1 provides a benchmark for guiding countries' investment efforts in the short term. Furthermore, in scenarios where investment levels are constant over time (e.g., 2% of GDP), the timing of when investment is converted into infrastructure stock is irrelevant, since the conversion of investment into capital will occur at a constant rate. In other words, lags would tend to offset each other, since the stock accumulated in a given year would reflect investments made in previous periods, thereby mitigating potential biases in the comparison between flows and stocks.

The plausibility of these assumptions depends on the circumstances. On the one hand, the time it takes for investment to become capital depends largely on the infrastructure sector. In water and sanitation, electricity, and some telecommunications projects, connecting to existing networks or carrying out smaller-scale works typically takes place within relatively short timeframes. In contrast, in road, urban, or air transportation projects, as well as in the construction of large treatment plants or major infrastructure projects, investment processes can extend for more than a year or be implemented gradually in phases. Furthermore, even if investment follows an upward or downward trend, it is difficult to observe abrupt and permanent changes in its aggregate levels[3]. In practice, aggregate investment evolves gradually, which gives the indicator a certain degree of year-over-year stability and reduces short-term volatility.

These considerations do not invalidate the presented estimates of investment needs; rather, they help to properly interpret possible discrepancies between investment efforts and contemporary changes in coverage indicators. In particular, part of the financed capital may be at various stages of implementation ("in the pipeline") and may only be reflected in the operational stock with a certain lag, which is consistent with the nature of infrastructure investment processes. In this regard, the assumption adopted constitutes a reasonable and transparent simplification for the type of exercise conducted.

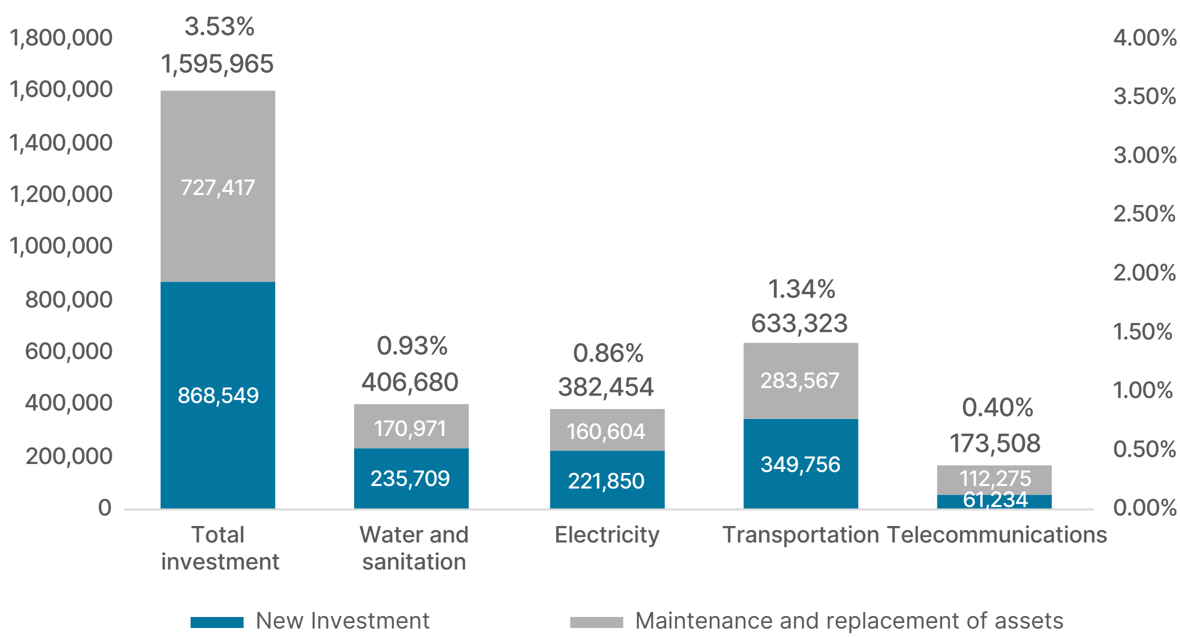
Figures 1 and 2 present the aggregate results of the exercise to update infrastructure gaps in Latin America and the Caribbean. Before discussing these results, it is important to emphasize that the updated estimates are fully comparable with those presented in Brichetti et al. (2021). Both exercises use a bottom-up and modular methodology that is consistent at the sectoral and country levels; they maintain the same coverage and quality targets associated with the Sustainable Development Goals; and they retain the 2030 timeline for achievement. The methodological details of the update exercise, as well as the information sources used, are described in Annex I.

Figure 1 shows the annual investment required to close infrastructure gaps in Latin America and the Caribbean during the 2025–2030 period, expressed as a percentage of regional GDP and broken down by sector. In aggregate terms, the region would need to mobilize investment equivalent to 3.53% of

3 This is related to the rigidity or inertia of infrastructure investment. Once a project is started, halting it is usually more costly than completing it, which smooths out sharp declines.

annual GDP, representing approximately USD 1.6 trillion, taking into account both new investment and spending on maintenance and asset replacement. Most of this investment is for new projects, although the maintenance and replacement components are significant, reflecting the simultaneous need to expand coverage and preserve the quality of the existing infrastructure stock. Taken together, these estimates illustrate the magnitude of the investment required to close the remaining gaps in coverage, and quality in the sectors analyzed, based on current levels.

Figure 1. *Total investment required to close the identified gaps over the 2025–2030 period (in millions of US dollars) and annual investment as a percentage of GDP by sector.*



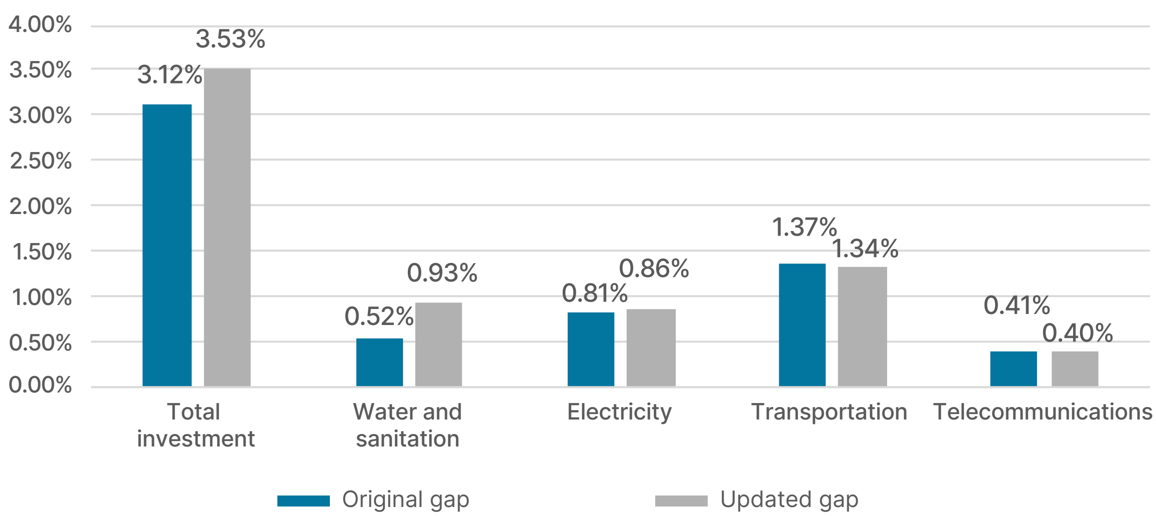
Source: Author's own calculations.

From a sectoral perspective, the transportation sector accounts for a significant portion of total investment (1.34% of GDP), followed by water and sanitation (0.93% of GDP) and electricity (0.86% of GDP). These three sectors account for the bulk of investment needs, both due to the magnitude of the remaining gaps and the capital intensity required to close those gaps. In contrast, the investment required in telecommunications is relatively lower (0.40% of GDP), reflecting coverage levels closer to established targets, although significant challenges remain in terms of quality and access for certain segments of the population.

Taken together, the results show that closing the infrastructure gaps in the region requires a substantial and sustained investment effort, with a heterogeneous sectoral composition and a significant share of spending on maintenance and replacement, underscoring the importance of a comprehensive strategy that combines capacity expansion with the preservation of existing capital.

Figure 2 compares these new estimates with the gaps originally estimated in Brichetti et al. (2021), using a standardized metric that allows for a direct comparison between the two analyses. The main finding emerging from this comparison is that the annual investment needs to achieve the SDG targets have increased compared to the original estimates. This increase implies that, despite the progress observed in coverage and quality indicators, the investment effort required going forward is greater than initially estimated.

Figure 2. *Investment needs as a percentage of regional GDP by infrastructure sector. Comparison between original and updated estimates.*



Source: Author's own calculations based on Brichetti et al. (2021).

This increase is not distributed uniformly across sectors: it is largely explained by water and sanitation, whose investment needs grow significantly (from 0.53% to 0.93% of GDP), while transport decreases slightly (from 1.37% to 1.34% of GDP, owing to the update of road costs using ROCKS) and telecommunications remains virtually unchanged. The jump in water and sanitation responds to two factors: a larger remaining gap in safely managed sanitation—where progress was slower than anticipated—and the update of unit costs based on Lentini (forthcoming). Thus, while transport remains the sector with the largest gap in levels, it is not the one driving the increase relative to the original estimate.

In addition, this widening of the aggregate gap reflects, in part, the fact that infrastructure investment levels observed during the 2019–2024 period have fallen short of what is needed to sustain the originally projected trajectory, resulting in a cumulative shortfall that must be made up within a shorter time frame. Consequently, the region now faces a greater challenge in terms of mobilizing resources for infrastructure if it intends to achieve the targets set for 2030.

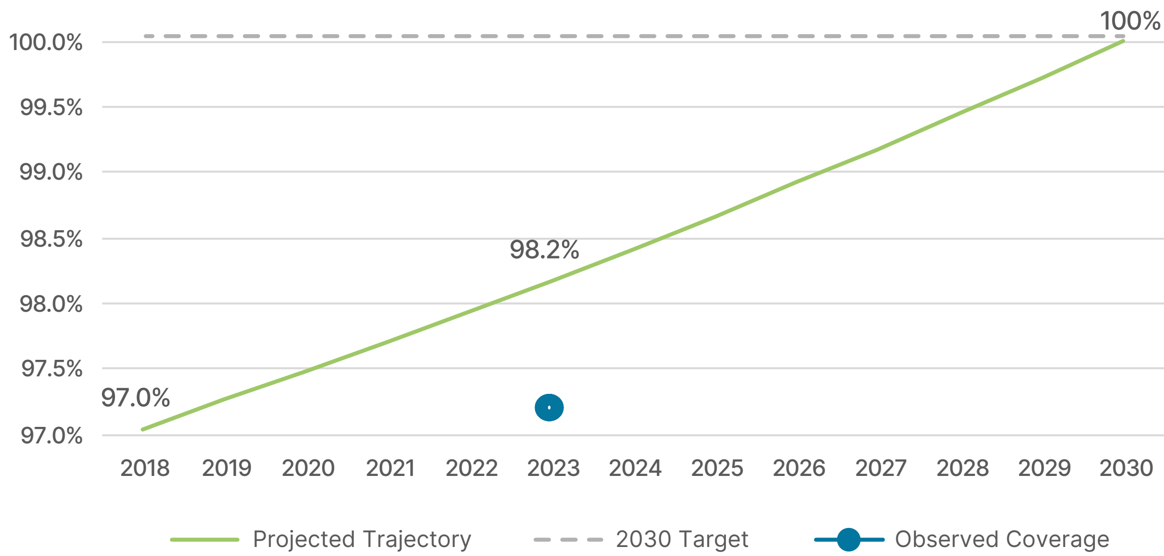
Overall, the results show that the region has made effective progress in most of the sectors analyzed, although the scale and pace of this progress are insufficient to ensure the achievement of the SDG targets by 2030 under current conditions. Furthermore, the contrast between observed progress and expected progress based on projected trajectories reveals divergences that constitute one of the study's main findings. These divergences, which manifest differently depending on the sector and country, raise important questions regarding the relationship between investment, capital accumulation, and improvements in service indicators, which will be addressed in the following sections.

The following subsections present the results of this comparison for each sector. They show the starting point in 2018, the projected coverage trajectory through 2030, and the actual value observed in the most recent year for which data is available. In general terms, only the telecommunications sector (particularly 4G coverage) showed progress in line with projections, while in electricity, safe water and sanitation, and road transportation, progress has been slower than expected, creating significant gaps that will require greater investment efforts within a tighter timeframe leading up to 2030.

ELECTRICITY

In 2018, the average electricity access coverage in Latin America and the Caribbean was 97.0%. According to the projected trajectory in the original study, coverage was expected to reach 98.2% by 2023. However, the actual figure was 97.2%, or one percentage point below the forecast (see Figure 3). To achieve the goal of universal coverage by 2030, this gap will need to be closed through additional investments estimated at 64,840 million USD, of which 20,288 million correspond to new investment, and 44,552 million to maintenance and asset replacement.

Figure 3. *Projected and observed electricity coverage rates in Latin America and the Caribbean, 2018–2030. In percentages.*



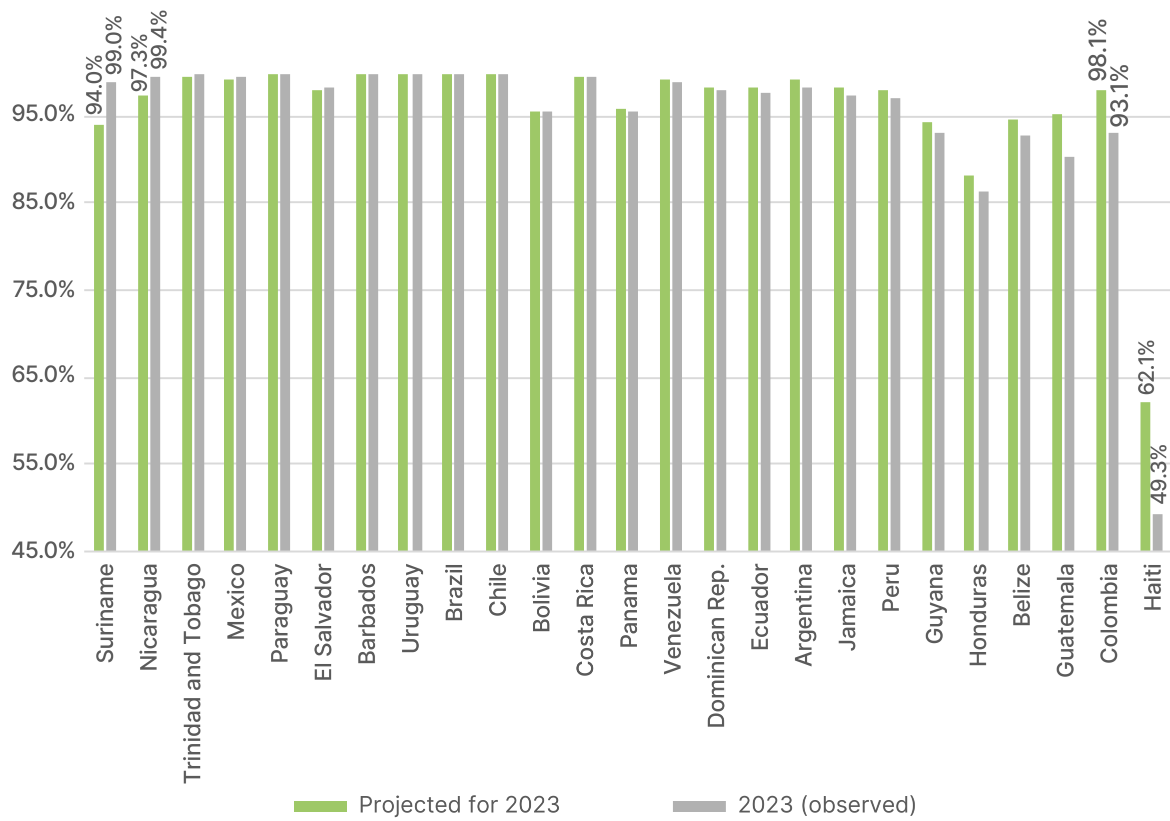
Source: Author's own calculations based on Brichetti et al. (2021).

At the country level, progress varies significantly relative to the projected trajectory (see Figure 4). Suriname and Nicaragua are the two countries that made the most progress: in the former case, observed coverage in 2023 exceeded the projection by 5.0 percentage points (99.0% vs. 94.0%), while in Nicaragua the difference was 2.1 p.p. (99.4% vs. 97.3%). At the other end of the spectrum, Haiti and Colombia recorded the largest shortfalls. In Haiti, observed coverage was 12.8 percentage points lower than projected (49.3% vs. 62.1%), while in Colombia it was 5.0 percentage points lower (93.1% vs. 98.1%).

To achieve the goal of universal coverage by 2030, this gap will need to be closed through additional investments estimated at 64,840 million USD, of which 20,288 million correspond to new investment, and 44,552 million to maintenance and asset replacement.

PAGE 23

Figure 4. *Electricity: projected and observed coverage by country, 2023. In percentages.*



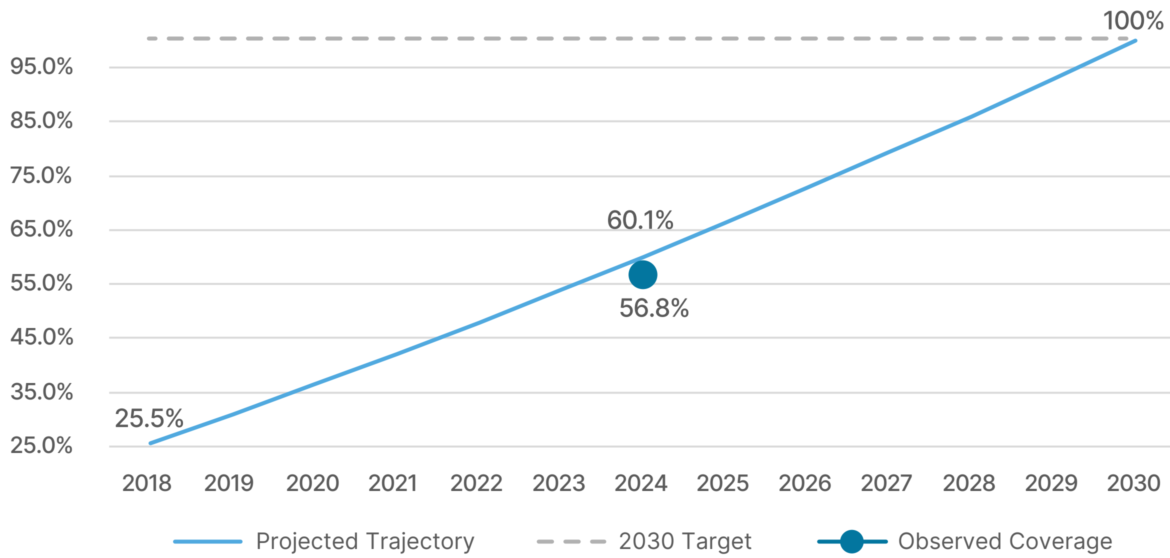
Source: Author's own calculations based on Brichetti et al. (2021).

WATER AND SANITATION

Safely Managed Water

Coverage of access to safe water in Latin America and the Caribbean rose from 25.5% in 2018 to 56.8% in 2024, representing a significant increase, although it remains below the 60.1% projected for that year according to the original trajectory. The goal for 2030 is to achieve universal coverage, so there is still a considerable gap to close to reach 100% (see Figure 5). To meet this goal, additional investments estimated at 134,247 million USD will be required for the period 2025–2030, of which 71,155 million USD correspond to new investment, and 63,092 million USD to maintenance and asset replacement.

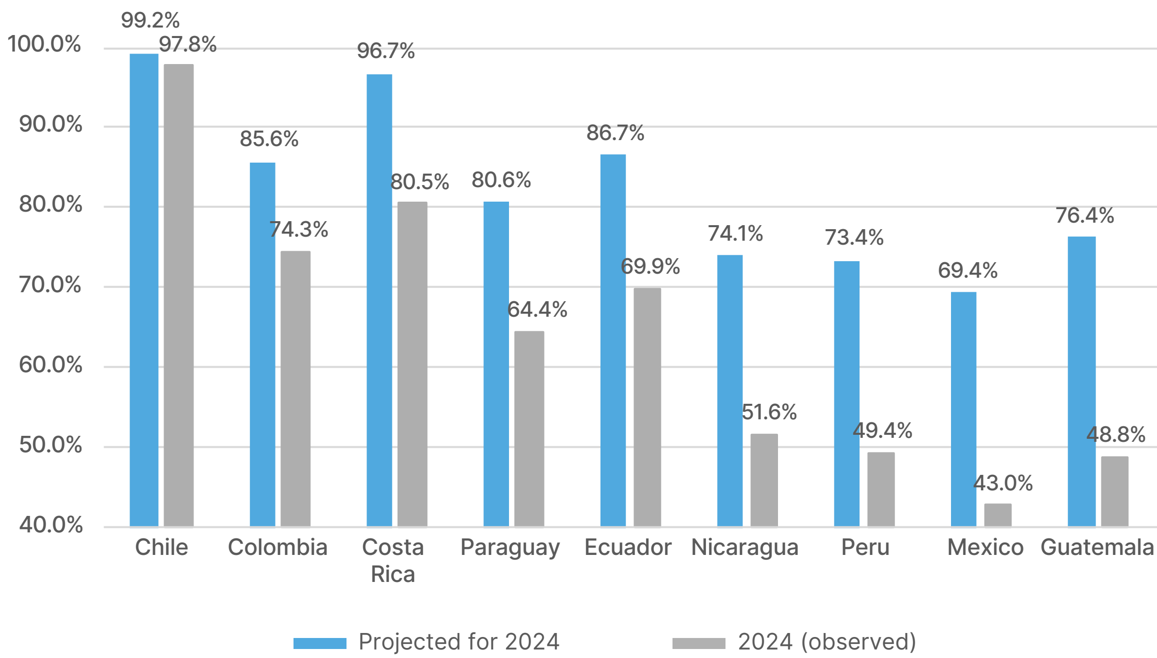
Figure 5. *Percentage of safe water supply coverage in Latin America and the Caribbean, 2018–2030. In percentages.*



Source: Author's own calculations based on Brichetti et al. (2021).

At the country level, it is observed that all countries experienced less progress than projected, with Guatemala, Mexico, and Peru recording the largest shortfalls (see Figure 6). In Guatemala, observed coverage was 27.6 percentage points lower than projected (48.8% vs. 76.4%); in Mexico, the difference from projected coverage reached 26.4 percentage points (43.0% vs. 69.4%), and in Peru, it was 24.0 percentage points (49.4% vs. 73.4%).

Figure 6. *Safely managed water: projected and observed coverage by country, 2024. In percentages.*



Source: Author's own calculations based on Brichetti et al. (2021).

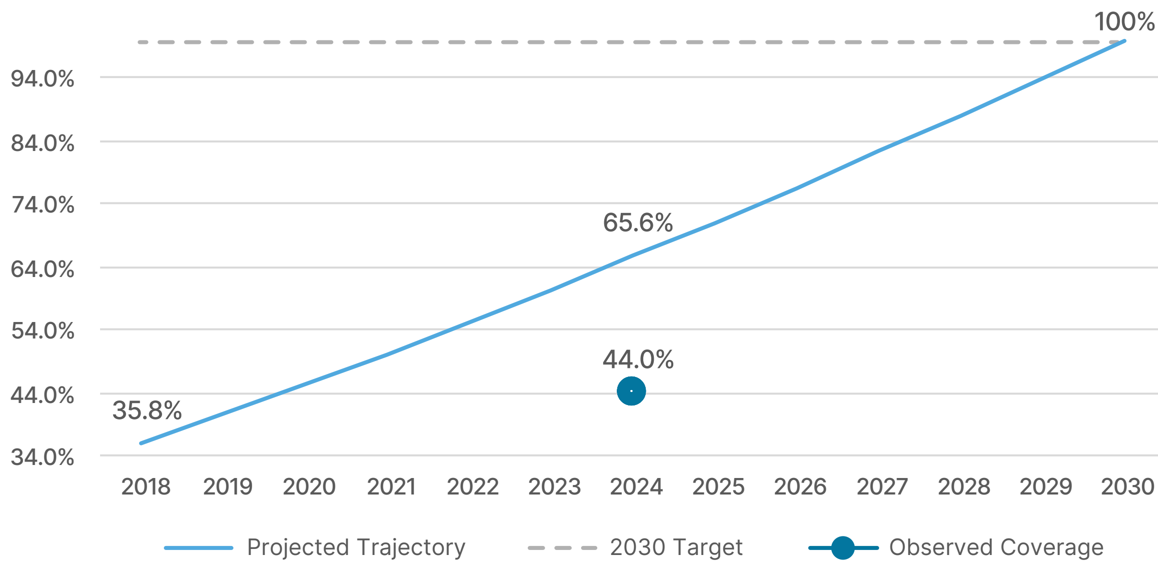
Safely managed sanitation

In the case of safe sanitation, regional coverage increased from 35.8% in 2018 to 44.0% in 2024, well below the 65.6% projected for that year (see Figure 7). The target set for 2030 is also to achieve universal coverage, so the cumulative shortfall is even more pronounced than in the case of safe water. Closing this gap will require mobilizing additional investments estimated at 256,366 million USD by 2030, of which 148,487 million USD corresponds to new investment and 107,879 million USD to maintenance and asset replacement.

The goal for 2030 is to achieve universal coverage, so there is still a considerable gap to close to reach 100%. To meet this goal, additional investments estimated at 134,247 million USD will be required for the period 2025–2030.

PAGE 26

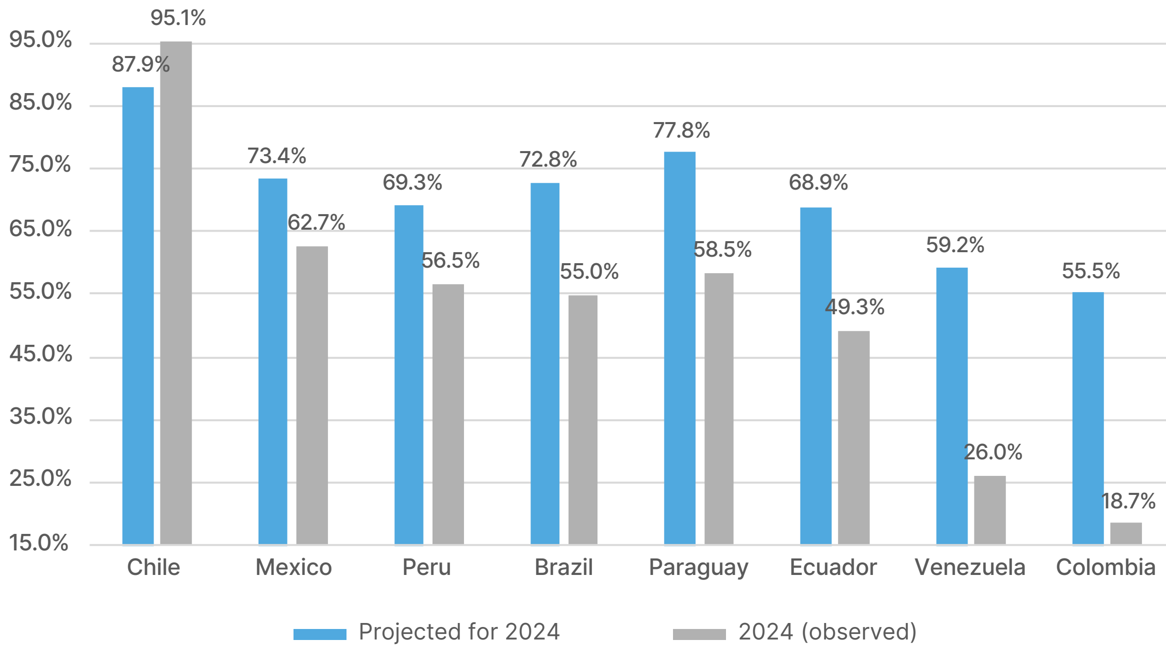
Figure 7. *Percentage of coverage for safely managed sanitation in Latin America and the Caribbean, 2018–2030. In percentages.*



Source: Author's own calculations based on Brichetti et al. (2021).

The analysis also reveals marked differences at the country level. Chile was the only country to outperform the projection by 7.2 percentage points (95.1% vs. 87.9%). In contrast, Colombia and Venezuela recorded the most pronounced shortfalls (see Figure 8). In Colombia, actual coverage was 36.8 percentage points lower than projected (18.7% vs. 55.5%), while in Venezuela it was 33.2 percentage points lower (26.0% vs. 59.2%).

Figure 8. *Safely managed sanitation: projected and observed coverage by country, 2024. In percentages.*



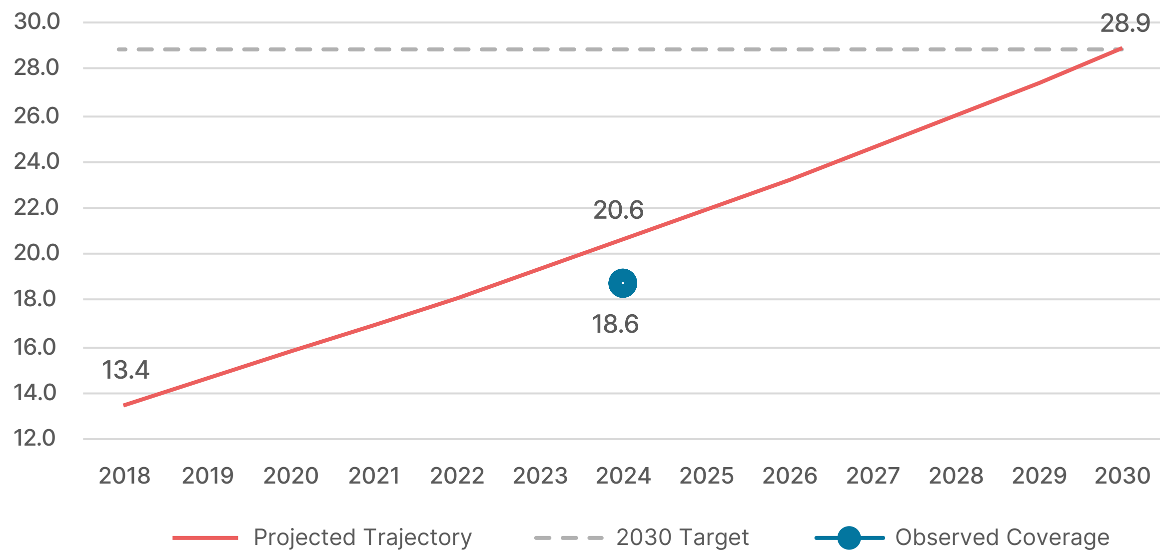
Source: Author's own calculations based on Brichetti et al. (2021).

TELECOMMUNICATIONS

Fixed Broadband

In the case of fixed broadband, the projected coverage rate for 2024 in Latin America and the Caribbean was 20.6 subscribers per 100 inhabitants, starting from an initial value of 13.4 in 2018 and with a target of 28.9 subscribers by 2030. However, the observed figure in 2024 was 18.6 subscribers per 100 inhabitants, indicating a lag behind the originally estimated trajectory (see Figure 9). To achieve the 2030 regional target, it will be necessary to mobilize approximately 56,243 million USD in additional investments in fixed digital infrastructure, of which 33,592 million USD corresponds to new investment and 22,651 million USD to maintenance and asset replacement.

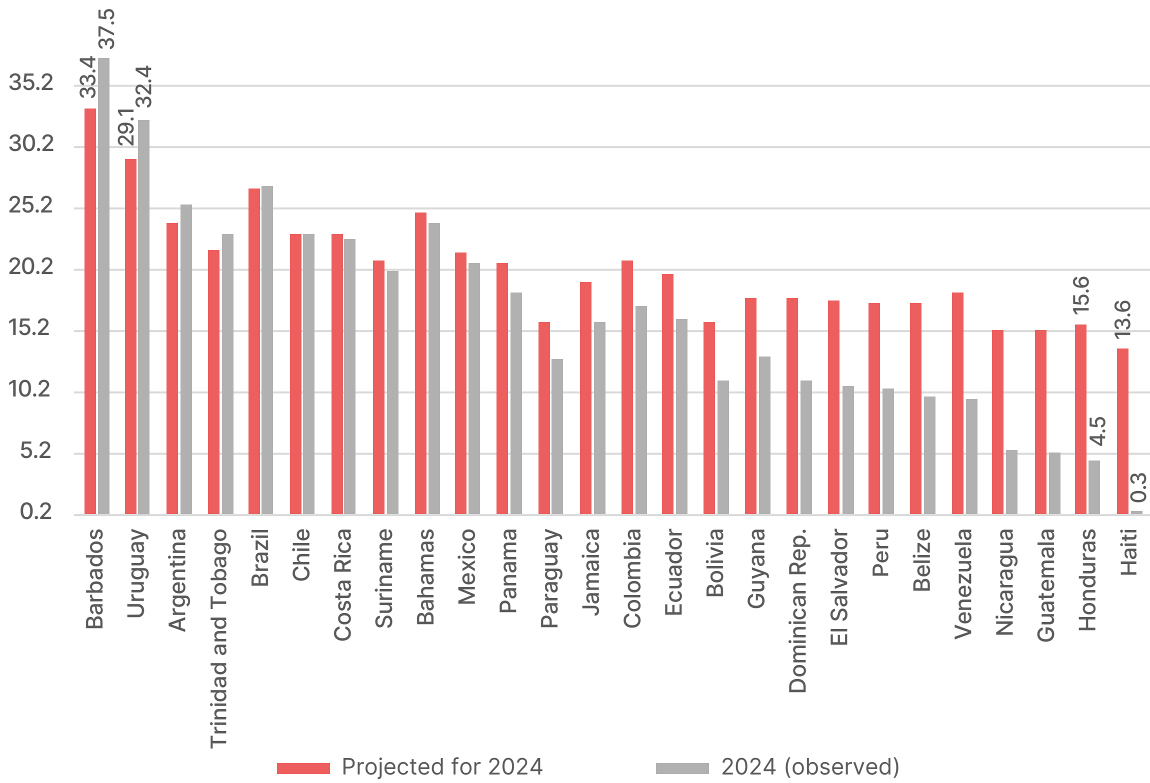
Figure 9. *Fixed broadband coverage in Latin America and the Caribbean, 2018–2030. In number of subscribers per 100 inhabitants.*



Source: Author's own calculations based on Brichetti et al. (2021).

At the country level, there is significant variation in the progress of coverage. Barbados and Uruguay stand out as the countries with the greatest relative progress (see Figure 10). In Barbados, coverage reached 37.5 subscribers per 100 inhabitants, exceeding the projected trajectory (33.4) by 4.1 subscribers. In Uruguay, the difference was positive at 3.3 subscribers per 100 inhabitants (32.4 vs. 29.1). In contrast, Haiti and Honduras show the greatest shortfalls. In Haiti, observed coverage was 13.2 subscribers per 100 inhabitants lower than projected (0.3 vs. 13.6), while in Honduras the negative difference reached 11.1 subscribers per 100 inhabitants (4.5 vs. 15.6).

Figure 10. *Fixed broadband: projected and observed coverage by country, 2024. In number of subscribers per 100 inhabitants.*



Source: Author's own calculations based on Brichetti et al. (2021).

Beyond the observed heterogeneity among countries, the expansion of fixed broadband repeatedly faces the challenge of extending connectivity to areas with low population density and hard-to-reach territories, where the deployment of traditional fixed networks is more costly and complex. In this context, it is particularly important to consider alternative technological solutions for bridging the last-mile gap, notably low-Earth orbit satellite connectivity networks, whose potential to expand broadband coverage in rural and remote areas is briefly discussed in Box 2.

Beyond the observed heterogeneity among countries, the expansion of fixed broadband repeatedly faces the challenge of extending connectivity to areas with low population density and hard-to-reach territories, where the deployment of traditional fixed networks is more costly and complex.

PAGE 33

Box 2.

LEO Satellite Connectivity and the Transformation of Access in Low-Density Areas

In the telecommunications sector, investment needs in Latin America and the Caribbean tend to be lower than in other infrastructure sectors. However, expansion into low-density rural areas faces a persistent challenge: the high cost of the "last mile," where the extension of fixed and fiber-optic networks significantly increases the cost per user and limits the economic viability of projects. This component has historically accounted for a substantial portion of the investment required to close residual connectivity gaps.

The emergence and rapid adoption of low-Earth orbit (LEO) satellite technologies are bringing about a structural shift in this approach by decoupling access to high-speed connectivity from physical network deployment. These solutions enable the provision of broadband service through direct installation at the point of consumption, significantly reducing the costs and timeframes associated with network expansion, and immediately expanding coverage to remote, rural, or hard-to-reach areas. In this sense, satellite connectivity not only reduces costs but also redefines the economic profile of service expansion.

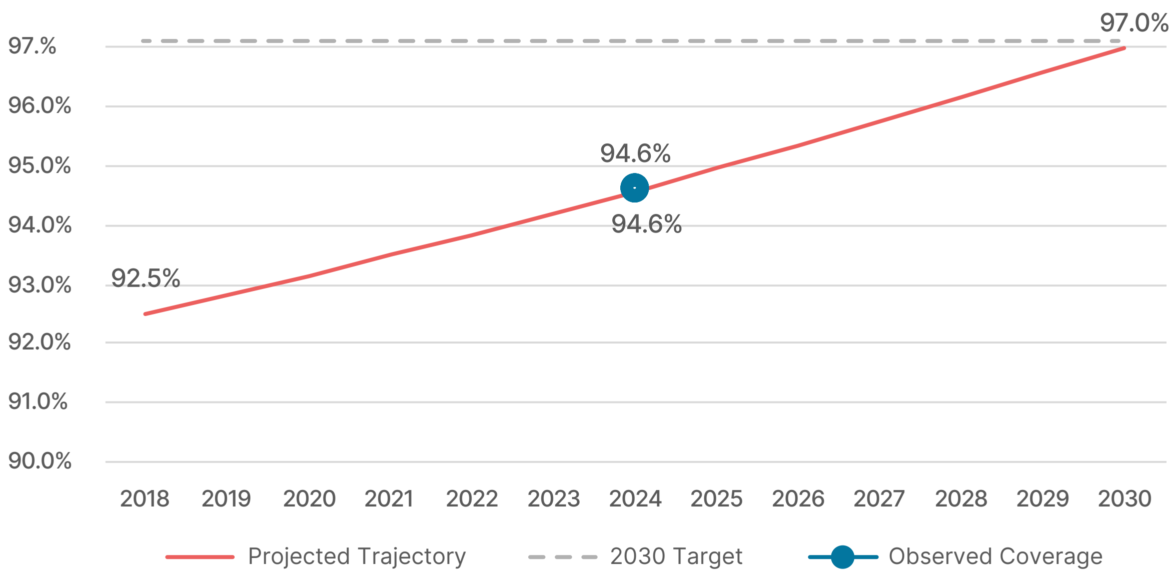
Brazil's recent experience illustrates the potential of this transformation. The national regulator's authorization for a significant expansion of LEO satellite capacity, coupled with its growing adoption in remote regions such as the Amazon, demonstrates that these technologies are already covering segments of the terrestrial network that have historically been underserved. This trend suggests that satellite connectivity is transitioning from niche solutions to a more prominent role within the telecommunications ecosystem in countries with vast territories.

Taken together, these advances indicate that estimates of telecommunications investment needs must account for the fact that technological progress can significantly reduce the incremental CAPEX associated with expansion in areas of low population density, while shifting part of the focus toward appropriate regulatory frameworks, affordability schemes, and policies aimed at the effective adoption of the service.

4G Networks

In the case of 4G technology, the projected coverage rate for 2024 was 94.6% of the population, up from 92.5% in 2018 and with a target of 97% by 2030. The actual coverage recorded in 2024 was 94.6%, in line with the originally projected trajectory (see Figure 11). To achieve the expected full coverage by 2030, additional investments estimated at 117,265 million USD will be required, of which 27,642 million USD correspond to new investment and 89,623 million USD to maintenance and asset replacement.[4]

Figure 11. *Percentage of 4G network coverage in Latin America and the Caribbean, 2018–2030. In percentages.*



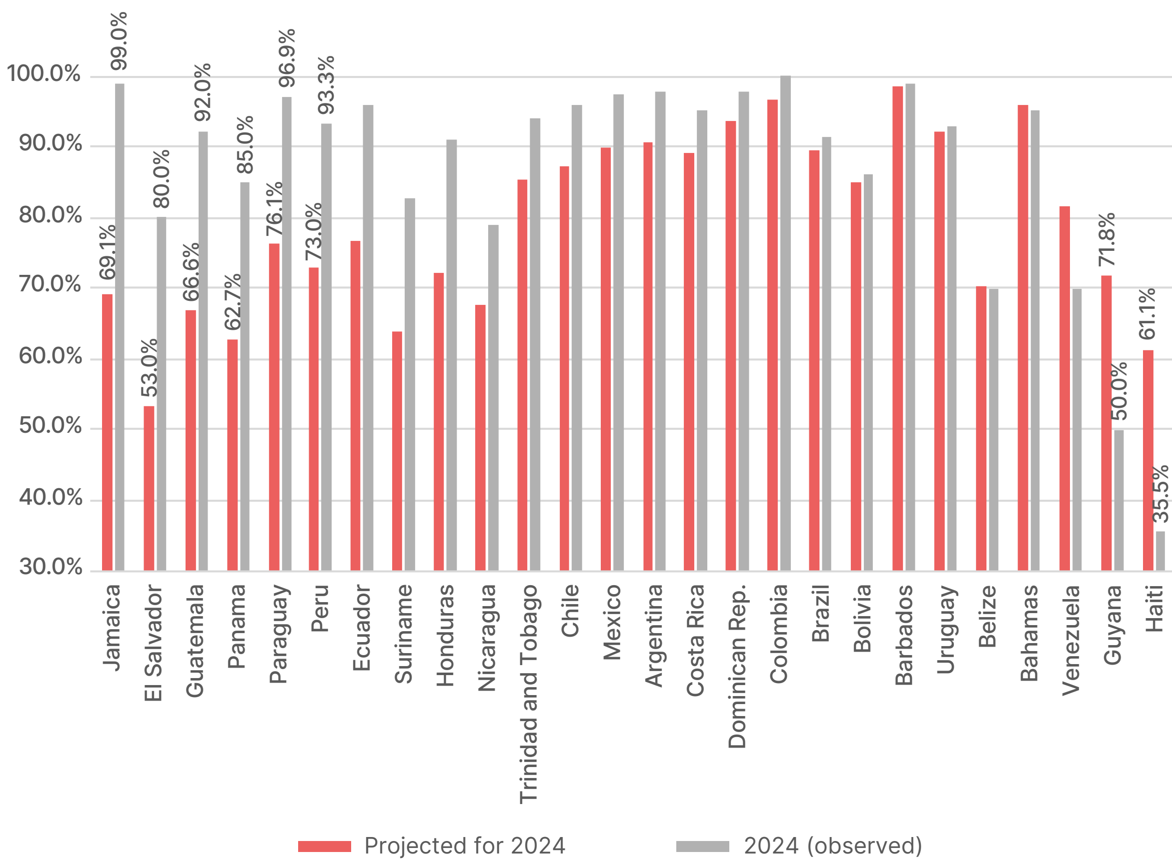
Source: Author's own calculations based on Brichetti et al. (2021).

At the country level, notable progress has been recorded in Jamaica, Guatemala, Panama, Paraguay, Peru, and El Salvador, among others, with

4 The original document did not consider the expansion of access to 5G networks. This update incorporates this component, using the same methodology applied to 3G and 4G to define the 2030 coverage target. The median figure for Asian countries—equivalent to 69% access—is adopted as the benchmark. Achieving this target will require an estimated investment of 518,133 million USD, of which 357,122 million corresponds to new investment and 161,011 million to maintenance and asset replacement.

coverage levels exceeding projections by more than 20 percentage points (see Figure 12). At the other end of the spectrum, Haiti and Guyana showed the greatest shortfalls: in Haiti, observed coverage was 25.6 percentage points lower than projected (35.5% vs. 61.1%), while in Guyana it was 21.8 percentage points lower (50.0% vs. 71.8%).

Figure 12. *4G networks: projected and observed coverage by country, 2024. In percentages.*



Source: Author's own calculations based on Brichetti et al. (2021).

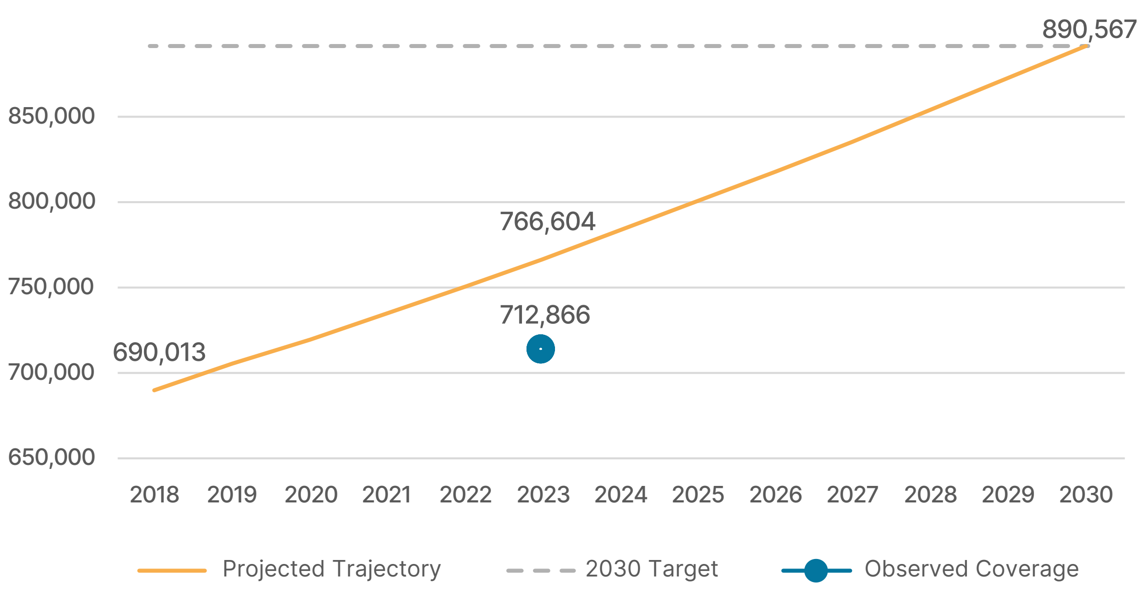
TRANSPORTATION

Road transportation

In the road transport sector, three dimensions of the regional road network were analyzed: paved kilometers, unpaved kilometers, and highways. In the case of paved kilometers, the original projection estimated that the network would reach 766,604 km in 2024, starting from an initial level of 690,013 km in 2018, with a target of 890,567 km by 2030. However, the observed length in 2024 was 712,866 km, representing a lag behind the originally projected trajectory (see Figure 13).

Taken together, these results show that, although the road network in Latin America and the Caribbean has grown since 2018, progress has been slower than anticipated in the original scenario. To achieve the 2030 regional targets across all three dimensions (paved, unpaved, and highway kilometers), it will be necessary to mobilize 522,070 million USD in additional investments, broken down into 238,502 million USD for new investment and 283,567 million USD for routine and periodic maintenance and asset replacement.[5]

Figure 13. *Number of paved kilometers in Latin America and the Caribbean, 2018–2030. In kilometers.*



Source: Author's own calculations based on Brichetti et al. (2021).

5 See Box 3 for a detailed description of the impact of updating unit costs on the estimate of the total gap.

Box 3.

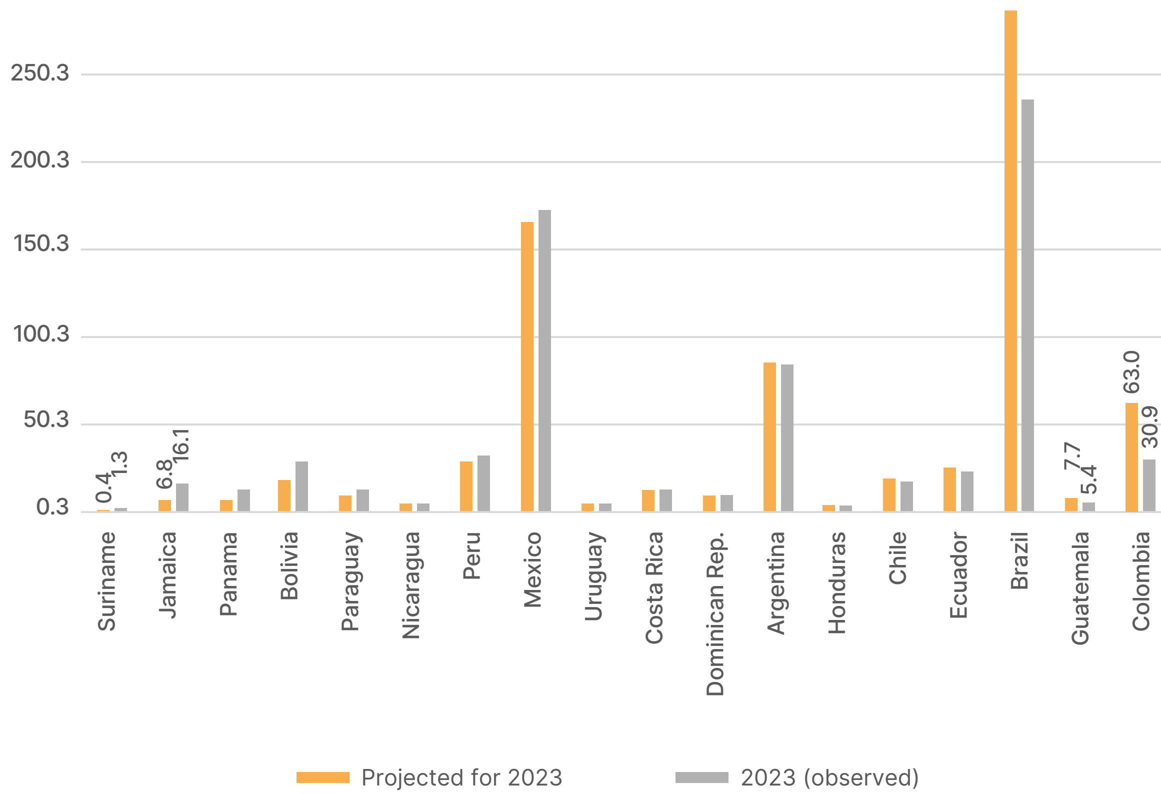
Impact of Updating Unit Costs in the Transportation Sector on the Investment Gap

In this update exercise, unit costs for the road transport sector are derived from the most recent version of the World Bank's *Road Costs Knowledge System (ROCKS)* database, which is the most up-to-date and methodologically consistent source available internationally for this type of estimation. Accordingly, the values previously used in the original exercise (adjusted for inflation) are replaced in their entirety by the new values from ROCKS. Since these new values are, on average, lower for the main construction components, their use results in a reduction in the estimated unit costs and, consequently, in the road sector's investment gap compared to what would have been obtained had the original values been retained.

In terms of magnitude, the changes are significant and vary depending on the type of project. In particular, the cost of widening roads from 2 to 4 lanes is reduced by about 45%, the construction of two-lane paved roads by approximately 18%, and the upgrade to paved surfaces by about 33%, while the costs for gravel roads show an increase of nearly 38%. In maintenance, routine costs remain virtually stable (with variations of around 2%), while periodic costs increase by about 35%. Overall, given the greater relative weight of construction components, the update tends to narrow the estimated gap without altering the physical infrastructure needs and reflects the use of the best information available to date for this type of estimate.

At the country level, there is marked variation in the pace of expansion of the paved road network compared to projections (see Figure 14). Suriname and Jamaica were the two countries with the largest relative increases compared to the expected trajectory. In the first case, the paved length exceeded the original projection by 191%, rising from a projected 0.4 thousand km to an observed 1.3 thousand km in 2023. In Jamaica, the increase was 138%, rising from an expected 6.8 thousand km to 16.1 thousand km. At the other end of the spectrum, Guatemala and Colombia recorded the largest shortfalls relative to the expected trajectory. In Guatemala, the shortfall reached 30%, with a projected value of 7.7 thousand km and an observed value of 5.4 thousand km. In Colombia, the paved network was 51% below the projection, with a projected value of 63.0 thousand km and an observed value of 30.9 thousand km.

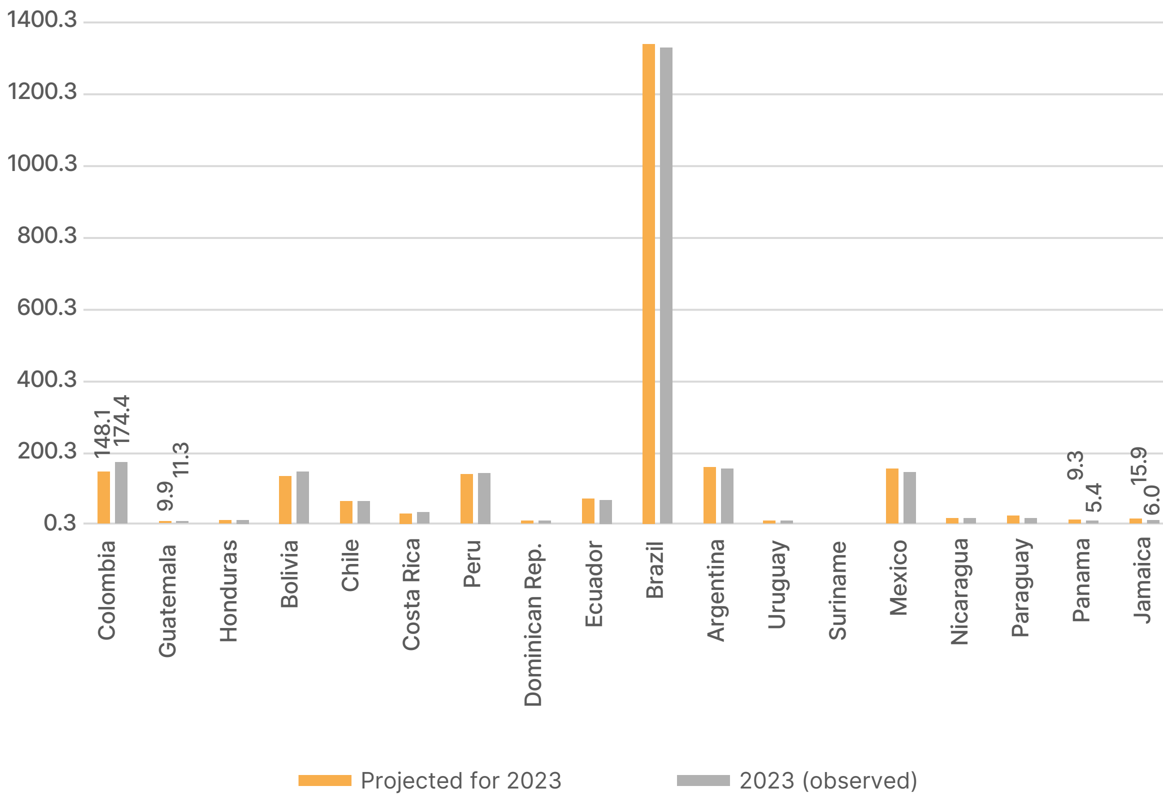
Figure 14. *Paved kilometers: projected and observed coverage by country, 2023. In thousands of kilometers.*



Source: Author's own calculations based on Brichetti et al. (2021).

For unpaved kilometers, the projection for 2023 was 2,363,718 km, while the actual figure was 2,359,446 km, which was lower than expected. At the country level, significant differences are also observed in the evolution of the unpaved road network compared to projections (see Figure 15). Colombia and Guatemala were the two countries that exceeded the original projections the most. In Colombia, the increase was 17.8%, with a projected value of 148.1 thousand km and an observed value of 174.4 thousand km. In Guatemala, the unpaved length was 14.7% higher than estimated, with a projected value of 9.9 thousand km and an observed value of 11.3 thousand km in 2023. At the other end of the spectrum, Panama and Jamaica recorded the largest shortfalls. In Panama, the negative difference reached 42.0%, with a projected value of 9.3 thousand km and an observed value of 5.4 thousand km. In Jamaica, the unpaved network was 62.4% below the projection, with a projected value of 15.9 thousand km and an observed value of 6.0 thousand km.

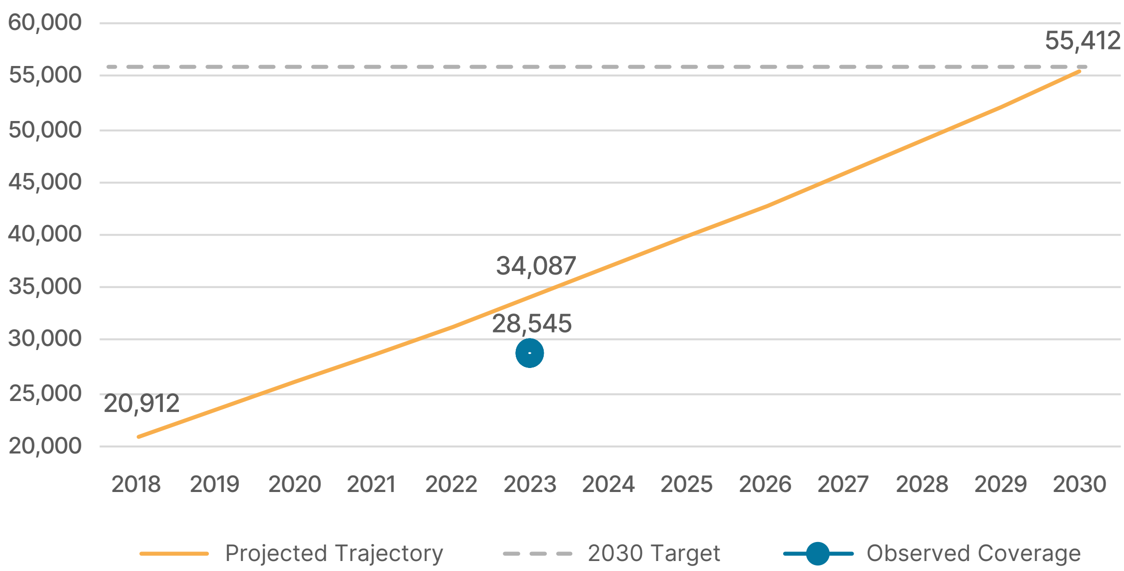
Figure 15. *Unpaved kilometers: projected and observed coverage by country, 2023. In thousands of kilometers.*



Source: Author's own calculations based on Brichetti et al. (2021).

As for highways, the original projection indicated that they should reach 34,087 km by 2023, starting from 20,912 km in 2018, with a target of 55,412 km by 2030. The observed value was 28,545 km, also falling short of the estimate (see Figure 16).

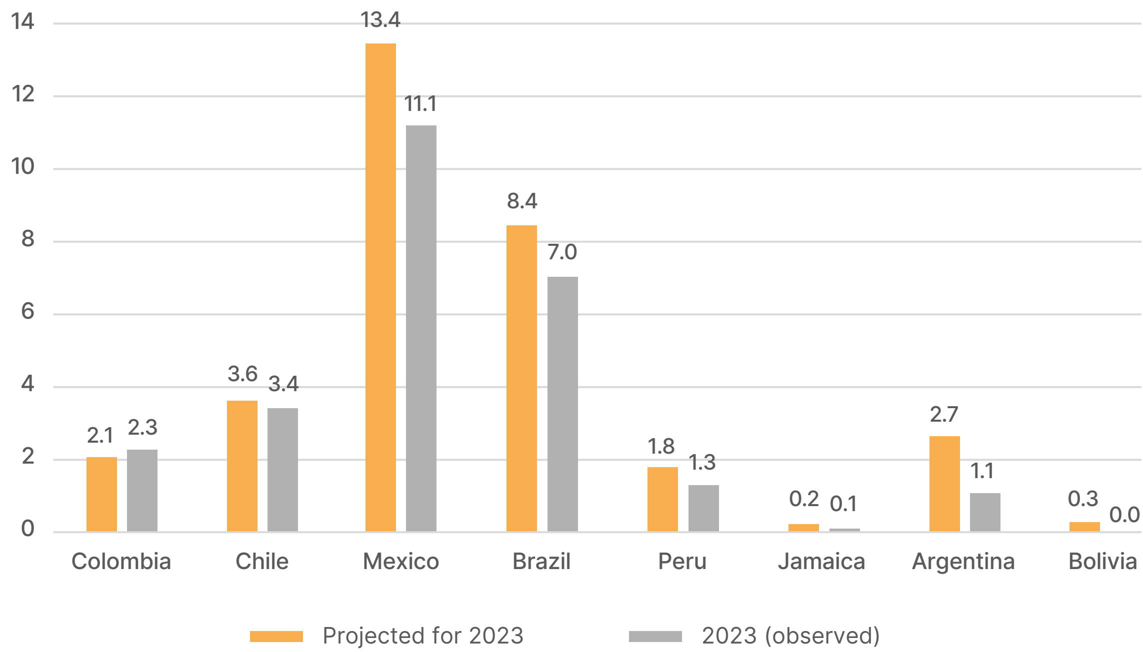
Figure 16. *Number of kilometers of highways in Latin America and the Caribbean, 2018–2030. In kilometers.*



Source: Author's own calculations based on Brichetti et al. (2021).

In the case of highways, there is also significant variation among countries (see Figure 17). Colombia was the only country to exceed the expected trajectory, with a highway length 10.0% higher than projected: it went from an estimated 2.1 thousand km to an observed 2.3 thousand km in 2023. At the other end of the spectrum, Argentina and Bolivia recorded values below expectations. In Argentina, the shortfall was 58.9%, with a projected value of 2.7 thousand km and an observed value of 1.1 thousand km. Finally, in Bolivia, the gap reached 95.8%, with a projected value of 0.3 km and an observed value of 0.0 thousand km.

Figure 17. *Highways: projected and observed coverage by country, year 2023. In kilometers.*



Source: Author's own calculations based on Brichetti et al. (2021).

In line with the Sustainable Development Goals, access to road transportation can be interpreted more strictly as the availability of roads that are passable year-round, rather than solely as the total length of the network. Although this document retains the original methodology of Brichetti et al. (2021)—based on the count of kilometers by road type—to ensure cross-temporal comparability, a complementary effort was made to estimate, using geospatial data, the proportion of the road network that is passable year-round in Latin American and Caribbean countries. The rationale, approach, and main results of this exercise are presented in Box 4.

Box 4.

Rural Road Access and Measurement of the Transport SDG: An Approach Based on All-Season Roads

As part of the analysis of infrastructure gaps in the transport sector, this exercise proposes to operationalize Target 9.1 of SDG 9, which relates to the rural population's effective access to year-round passable road infrastructure (all-season roads). In line with this approach, an indicator of rural road access is estimated for all countries in Latin America and the Caribbean in 2025, as a synthetic and comparable measure of rural road access across countries.

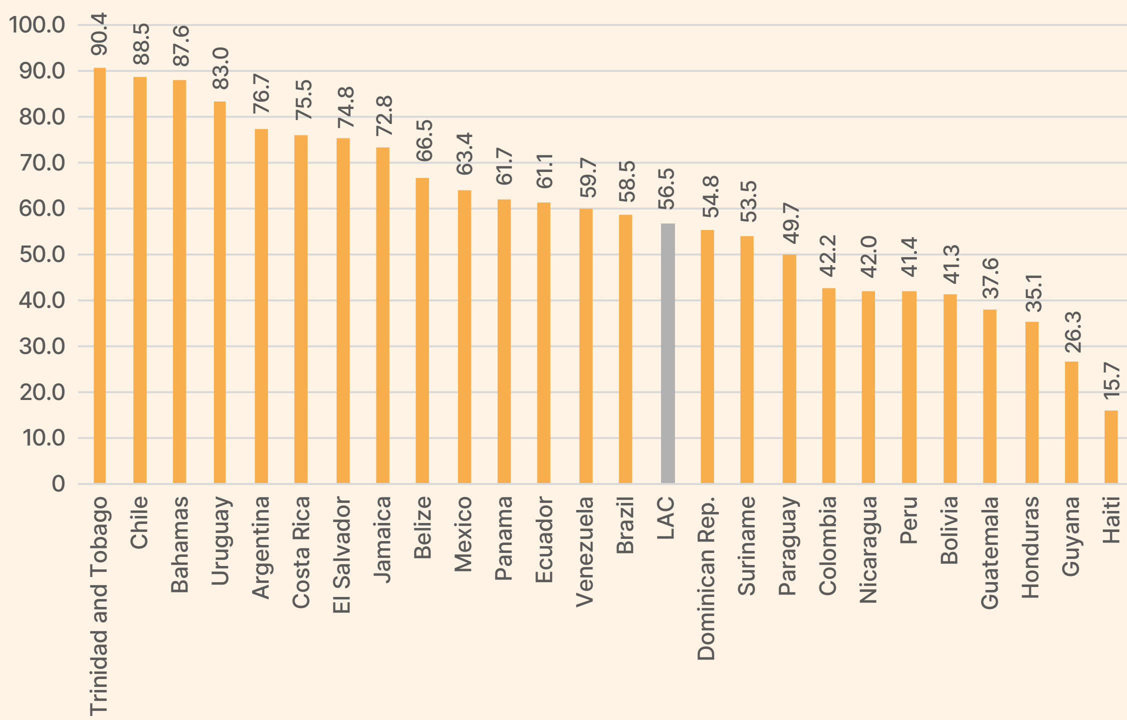
The rural road access indicator estimate combines geospatial data on the rural population obtained from the GHS-POP and GHS-SMOD rasters of the Global Human Settlement Layer with information on primary, secondary, and tertiary roads based on OpenStreetMaps data. Since information on the seasonal passability of roads is not uniformly available, a proxy for all-season roads is constructed based on observable functional attributes of the network, such as surface type and maximum speed limit. To mitigate issues with missing data, these attributes are supplemented using a two-stage imputation procedure that combines criteria of spatial proximity within the same road (±10 km) and representative statistics at the road segment level (mode for surface type and median for speed). Based on this information, roads are classified as high, medium, or low quality; for the calculation of the rural road access indicator, only high- and medium-quality roads are considered all-season roads—that is, paved roads with maximum speeds of 40 km/h or higher.

The results of the rural road access indicator show marked heterogeneity in levels of rural road access across the region. For LAC as a whole, the rural road access indicator stands at 56.5%, meaning that more than half of the rural population lives within 2 kilometers of a road that is passable year-round.[a] At the upper end of the distribution are Trinidad and Tobago (90.4%), Chile (88.5%), the Bahamas (87.6%), and Uruguay (83.0%), all of which have high levels of rural access. At the other end of the spectrum, the lowest index values are found in Haiti (15.7%) and Guyana (26.3%), followed by Honduras

[a] The values presented here are lower than those of the official applications of the Rural Access Index (RAI) owing to a more demanding all-season road criterion. While the official definition admits any road passable throughout the year, including unpaved ones, only paved roads with maximum speeds of 40 km/h or higher are considered here. This is because the available information does not make it possible to verify whether an unpaved road is effectively passable year-round, so a conservative criterion based on observable network attributes was adopted.

(35.1%) and Guatemala (37.6%), highlighting a marked disparity among countries within the region (see Figure B4.1).

Figure B4.1. *Rural road access indicator in Latin American and Caribbean countries, 2025. In percentages.*



Source: Prepared by the authors based on data from the Global Human Settlement Layer and OpenStreetMaps.

Air Transportation

In the case of air transport, closing the gap in access to airport infrastructure by 2030 will require a total estimated investment of 12,492 million USD in Latin America and the Caribbean. This amount corresponds to the construction, expansion, or upgrading of 106 airports, of which 6 are large, 15 are medium-sized, and 85 are small (data from Brichetti et al., 2023). Brazil accounts for the bulk of the investment effort, with 33 additional airports required and an estimated investment of 3,560 million USD, followed by Nicaragua (26 airports, 3,248 million USD) and Venezuela (15 airports,

Colombia was the only country to exceed the expected trajectory, with a highway length 10.0% higher than projected: it went from an estimated 2.1 thousand km to an observed 2.3 thousand km in 2023. At the other end of the spectrum, Argentina and Bolivia recorded values below expectations.

PAGE 42

1,611 million USD). These three countries account for nearly 65% of the total estimated investment in the aviation sector in the region.

Electromobility

Regarding electromobility, the results of the IDB study “Costs of Electromobility in Latin America and the Caribbean” were used, which estimates the book cost of electrifying the urban bus fleets in 149 cities with populations exceeding 500,000 in the region. The analysis considers three main components: (i) the renewal of the bus fleet, (ii) the expansion of public charging infrastructure, and (iii) the associated increase in electricity demand. The study projects the transition through 2050 under three electric bus penetration scenarios (pessimistic, moderate, and optimistic), defined based on four categories of cities according to their population and level of commitment to transportation electrification.

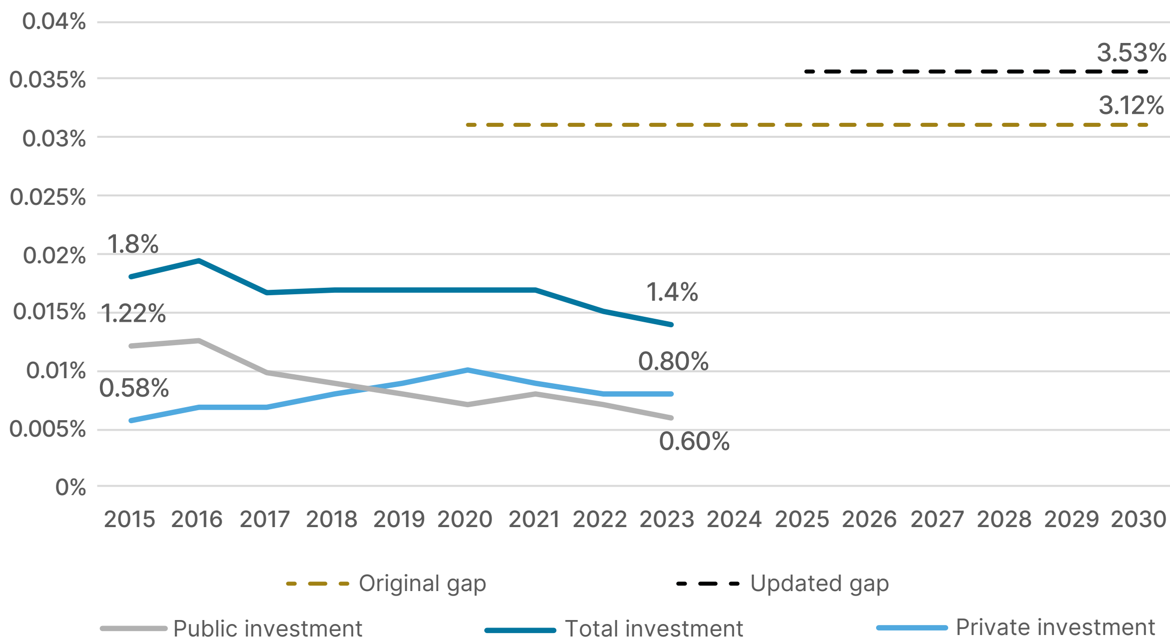
To maintain consistency with the time horizon of the other sectors analyzed and with the targets established in the SDGs, this update considers only the investment required between 2025 and 2030. The results show that, in the pessimistic scenario, the investment requirement amounts to 12,939 million USD for the entire region; in the moderate scenario, it rises to 20,061 million USD; and in the optimistic scenario, it reaches 31,176 million USD. The largest amounts are concentrated in Brazil and Mexico, which together account for a significant proportion of the required investment, followed by Colombia, Argentina, Chile, and Peru, where the combination of large urban fleets and more ambitious electrification commitments increases the estimated investment.

CHAPTER 3

Infrastructure Investments in LAC during the 2015–2023 Period

New estimates of the infrastructure gap, updated with the latest data available through 2025, indicate that the investment needs to achieve the infrastructure-related SDGs by 2030 have increased by 13% compared to the original estimates by Brichetti et al. (2021). This new information is consistent with the fact that countries in the region have invested significantly less in infrastructure sectors during the 2015–2023 period than the amounts identified as necessary to achieve the SDGs in the original 2021 analysis, as shown in Figure 18.

Figure 18. *Infrastructure investment needs in Latin America and the Caribbean as a percentage of regional GDP. Comparison between estimated gaps and annual public, private, and total investment.*



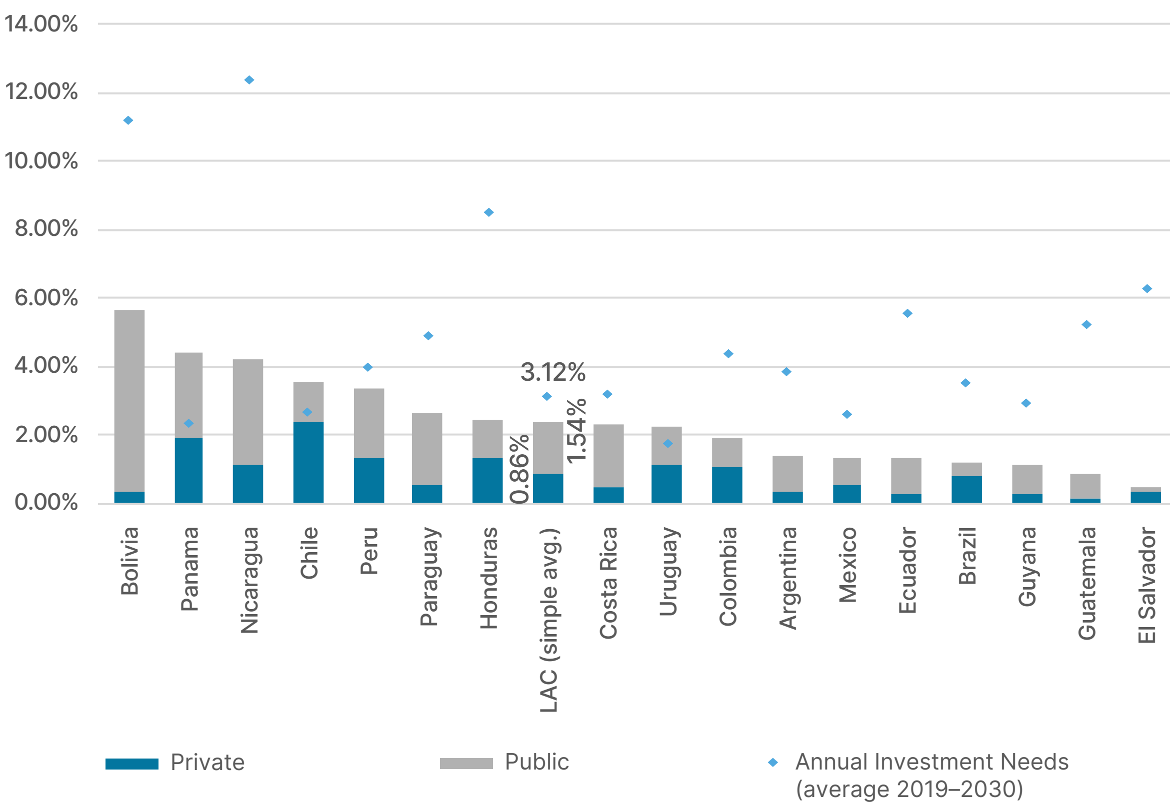
Source: Author's own calculations based on Brichetti et al. (2021).

Infrastructure investment levels in the region during the 2015–2024 period averaged 1.67% of GDP annually, about half of the requirements identified in the original gap analysis. Although the period under analysis includes the years 2020 and 2021—during which the effects of the COVID-19 pandemic were in full force, limiting the ability to finance and execute infrastructure investments—an additional cause for concern is the downward trend in investment in LAC. Between 2015 and 2023, total infrastructure investment in

LAC declined by nearly 25%, a reduction primarily driven by a drop of nearly 55% in public investment. Private investment—which currently accounts for the majority of infrastructure investment in the region—has been more stable but has failed to offset the decline in public investment.

This concerning situation at the regional level is not uniform when analyzing infrastructure investment in individual countries of the region, as shown in Figure 19. However, a consistent pattern is that most countries in the region—with the exception of Chile, Uruguay, and Panama—invest less than the estimated investment needs required to achieve the infrastructure-related SDGs in a timely and effective manner.

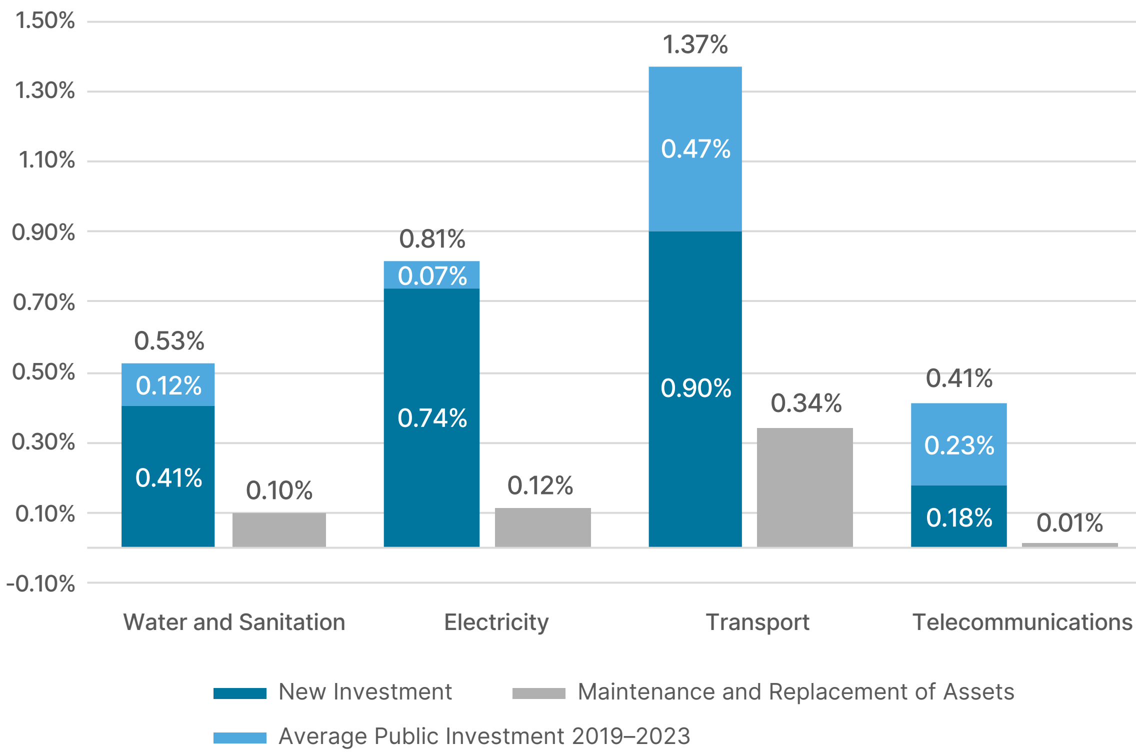
Figure 19. *Infrastructure investment needs by country. Comparison with average investment for 2015–2023 as a percentage of GDP.*



Source: Cavallo and León-Gómez (2026) and Brichetti et al. (2021).

The reported investment levels are low, which explains why, although there has been progress in closing gaps in the coverage and quality indicators analyzed, this progress is insufficient to achieve the SDGs. Figure 20 shows, for example, that when we analyze public investment in the various infrastructure sectors included in this report for the 2019–2023 period[6], in three of the four sectors, investment does not cover the costs of maintaining and replacing existing assets.

Figure 20. *Infrastructure investment needs in Latin America and the Caribbean by infrastructure sector. Comparison with average public investment for 2019–2023 as a percentage of GDP.*



Source: Author's own calculations based on Brichetti et al. (2021).

In short, what we observe is a divergence between the trends in the indicators of coverage and quality of the surveyed services and the expected behavior of these variables based on the collected investment data. Understanding and explaining the sources of this divergence is essential for establishing effective public policies aimed at closing the observed gaps, which we will focus on in the next section of this document.

6 Excluding telecommunications, as it is a sector in which investment is predominantly private.

CHAPTER 4

Discrepancies Regarding Investment Data

The increase in annual investment needs for the 2025–2030 period required to achieve the SDGs is not surprising when one considers that the region's actual levels of infrastructure investment during the 2015–2023 period were significantly below the needs originally estimated by Brichetti et al. (2021). Even so, the degree of progress toward achieving the SDGs, as measured by the coverage and qualitative indicators surveyed, is greater than might be expected given the levels of public and private investment actually observed.

Understanding the reasons for this divergence has become a top public policy priority. While there are known factors that may partially explain these differences—such as a significant reduction in population growth rates (Box 5) and divergences in the growth rates of the region's economies compared to those assumed in the original exercise—these explanations are quantitatively insufficient.

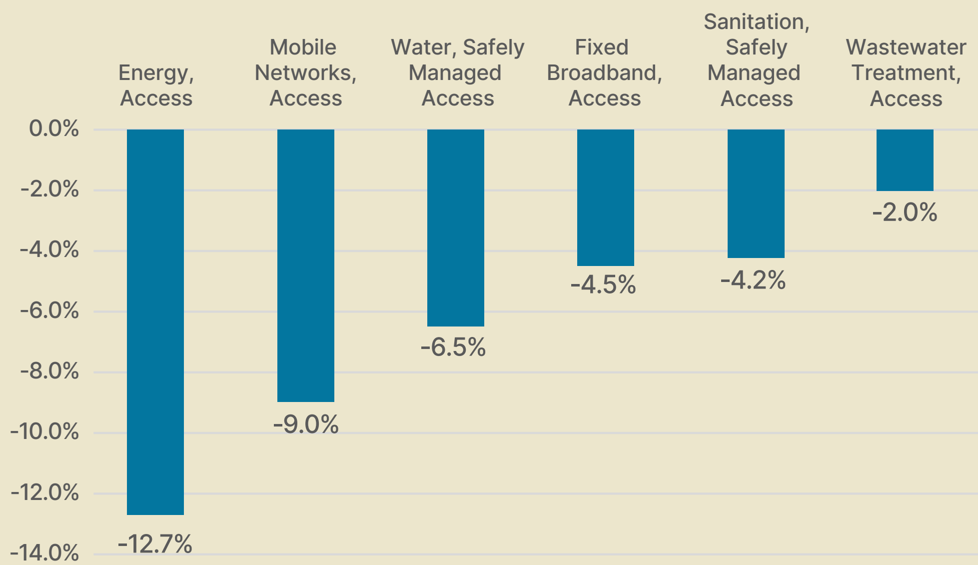
Box 5.

The Impact of Declining Population Growth Rates on Original Gap Estimates

The update of investment needs incorporates a revision of LAC's demographic projections through 2030, based on the World Bank's current publication (July 2025). This revision directly affects the infrastructure investment gaps estimated in Brichetti et al. (2021), in which the projected regional population for 2030 stood at 689.7 million people, whereas in the present estimate that projection stands at 671.4 million, implying a 2.6% decline. This decline in the population projection is primarily due to stagnating and declining birth rates in the region, reflecting a structural process of demographic transition, and to a lesser extent to temporary effects associated with the pandemic shock.

Since the quantification of infrastructure gaps depends directly on the number of new connections required to meet population growth, this demographic revision translates into a reduced need for new connections, assuming all other parameters of the exercise remain constant (access rates, unit connection costs, and service standards). In this context, it is observed that the decline in the projected population reduces connection needs across all infrastructure sectors (see Figure B5.1), with more pronounced decreases in electricity (12.7%) and mobile networks (9.0%), and more moderate decreases in safely managed water (6.5%), fixed broadband (4.5%), safely managed sanitation (4.2%), and wastewater treatment (2.0%).

Figure B5.1. *Reduction in connection needs attributable to the update of demographic projections by infrastructure sector. In percentages.*



Source: Author's own calculations based on Brichetti et al. (2021). Note: For the water, sanitation, and electricity sectors, the decrease is expressed as the percentage reduction in the number of household connections required. In the case of telecommunications and wastewater treatment, the decrease is expressed as the percentage reduction in individual connections, at the person level.

Given this scenario, there are various factors—which are not mutually exclusive—that may help explain this behavior. On the one hand, it is possible that the original estimates overestimated the investment needs required to achieve the SDGs. Similarly, it is also possible that investment levels in the region's infrastructure sectors are underestimated. Finally, due to the very nature of investment, physical infrastructure assets may materialize with a certain time lag.

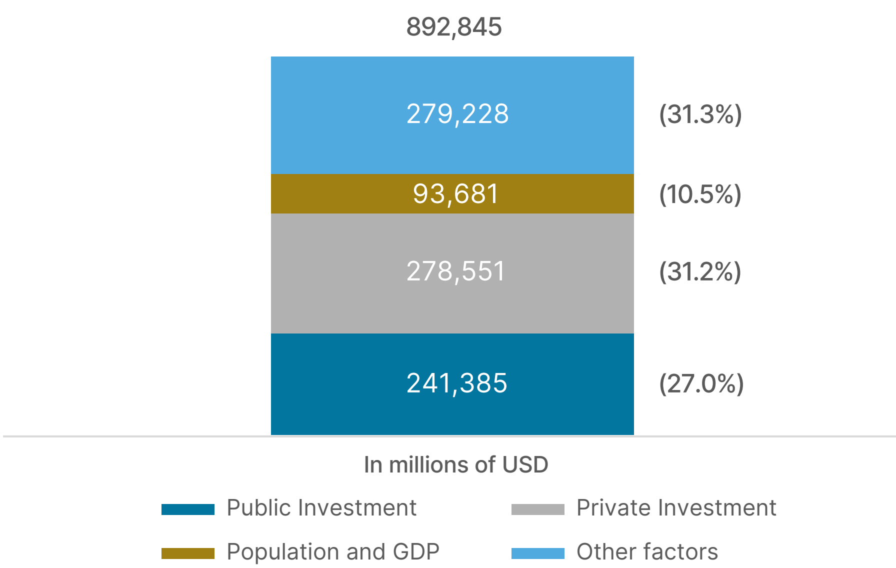
While it is not possible to definitively rule out the possibility that the originally estimated investment needs are overestimated, there is ample evidence indicating that this hypothesis is not the primary explanatory factor. First, the estimates in the original study were made using a conservative approach with respect to the unit costs actually used to close the gaps. Furthermore, when updating the analysis—using newly available information—no significant differences were detected between the actual unit costs used and those used in the original analysis. Second, the unit costs cited correspond to reference values that generally do not incorporate the inefficiencies typically observed when carrying out infrastructure projects in practice (cost overruns, delays, etc.), so it is to be expected that the investment needs to close the gaps are underestimated rather than overestimated. Finally, the estimated investment needs did not account for the full scope of infrastructure investments that countries must undertake, both because certain subsectors were not included (water projects, storm drains, for example) and because, within the included sectors, there are ancillary projects that had not been valued (for example, investments related to the road network such as highway access roads, improved port access, etc.). Given that the observed infrastructure investments include all investments made, it is expected that progress in the reported coverage and quality indicators will be less than anticipated, because part of these investments was directed toward investment needs not included in the original analysis. In this regard, as noted in Brichetti et al. (2021), the estimates presented should be interpreted as a floor for the infrastructure investment needs required to make progress toward achieving the SDGs.

Furthermore, the relationship between investment and changes in coverage and quality indicators depends critically on the timing of the investment and the lag between its execution and its materialization in stock (discussed in Box 1); therefore, an immediate correlation between the two is not necessarily expected. Although the downward trend in investment might suggest that part of the observed progress stems from investments made in previous periods, this channel alone is not sufficient to explain the observed divergences between trends in coverage and contemporary investment levels.

To quantify this divergence, an aggregate analysis was conducted for LAC that breaks down the reduction in the estimated gap relative to that calculated in Brichetti et al. (2021) at prices current to this update. In absolute terms, the total gap narrowed by 892,845 million USD (see Figure 21). Of this amount, cumulative public investment for the 2018–2023 period totals 241,385 million USD, equivalent to 27.0% of the total reduction observed. Meanwhile, cumulative private investment amounts to 278,551 million USD, representing 31.2%. Together, public and private investment account for 519,936 million USD, or 58.2% of the total reduction in the gap. Furthermore, the update of structural assumptions—specifically, updates to population and gross domestic product projections—accounts for an additional decrease of 93,681 million USD, equivalent to 10.5% of the total. The remainder, approximately

279,228 million USD (31.3%), is attributed to other factors not explicitly captured in this aggregate analysis, such as the lags between investment and the maturation of works; the underreporting of investment, especially private investment; a possible overestimation of needs; inaccuracies in coverage data; or improvements in efficiency and technology that reduce the cost of closing each unit of the gap. This exercise, which is illustrative in nature, provides an order of magnitude for the relative contributions of each component without establishing a strict causal relationship between investment and the reduction of the gap.

Figure 21. *Contribution of factors to the estimated reduction in the infrastructure investment gap in Latin America and the Caribbean. In millions of dollars and as percentages.*



Source: Author's own calculations based on Brichetti et al. (2021).

Consequently, while the previous analysis suggests that the observed total investment is consistent with the magnitude of the estimated reduction in the gap, questions remain regarding the quality, coverage, and composition of the available data—particularly with regard to private investment and its classification between coverage expansion and maintenance. Assessing the hypothesis that infrastructure investment is underestimated—whether due to coverage limitations in the available sources or the use of estimation

Given that the observed infrastructure investments include all investments made, it is expected that progress in the reported coverage and quality indicators will be less than anticipated, because part of these investments was directed toward investment needs not included in the original analysis.

PAGE 55

assumptions, particularly in the case of private investment—is essential for evaluating the feasibility of LAC achieving the SDGs on time and in full. There are multiple channels through which this hypothesis may hold true, which we will analyze in the following subsections.

MEASURING INFRASTRUCTURE INVESTMENT

Measuring infrastructure investment poses significant conceptual and methodological challenges. First, it requires precisely defining what is meant by infrastructure, distinguishing between its different types and sectors. In this publication, the reported figures refer to investment in public infrastructure in the economic sector, regardless of whether it comes from the public or private sector (see Figure 22).

Figure 22. *Infrastructure classification by type.*

Infrastructure Service	Investment Type	Sector	
		Economic	Social
Public	Private Investment Public Investment	Transportation networks (roads, ports, railways, airports), power generation and transmission, water and sanitation systems, telecommunications networks, among others.	Schools, universities, hospitals, public housing, cultural and sports facilities, street lighting, and administrative buildings, among others.
Private	Private Investment	Privately owned logistics centers, industrial parks, data centers, power generation assets, and utility companies, among others.	Private hospitals, private universities, senior care centers, commercially operated cultural or recreational facilities, among others.
	Public Investment	It is rarely classified as public investment, although it typically involves the use of public resources in strategic infrastructure projects that the government seeks to promote (e.g., land concessions in industrial parks, tax incentives, and subsidies, among others).	

Source: Author's own calculations.

Second, investment in infrastructure requires identifying the entity responsible for measuring it and the applicable accounting criteria. Unlike private investment, public investment—like any other component of public spending—is subject to accounting and accountability requirements, which in principle would facilitate its accurate measurement. However, classification criteria are not necessarily uniform. An illustrative example is the accounting treatment of Public-Private Partnerships (PPPs) in national accounting systems. Although each country applies its own regulations and there are international standards that seek to harmonize their recording—such as IPSAS 32 and ESA 2010—these differ in key aspects. As a result, the same project may be recorded on the balance sheet of either the public or the private sector, directly affecting the statistical measurement of investment and its accurate identification.

Limitations in Measuring Public Investment in LAC

There are primarily two sources of information for measuring public investment in LAC: national accounts and fiscal accounts. In the first case, public investment is typically estimated using the Government Gross Fixed Capital Formation (GGFCF), which provides comparable series across countries and over time. However, it is an imperfect measure of investment in economic infrastructure, since, in addition to machinery and equipment, it includes social infrastructure and public housing, among other components that fall outside the sectoral definition adopted in this document. Therefore, although it facilitates international comparison, GGFCF tends to be an imprecise measure of public economic infrastructure.

Second, investment can be estimated based on an analysis of each country's fiscal accounts. However, the classification, coverage, and level of disaggregation vary significantly, which limits their comparability across countries. Furthermore, in many cases, the available information typically corresponds to budgeted investment, so it does not necessarily reflect the levels of investment actually executed. Given these limitations, various efforts have sought to consolidate and harmonize fiscal data for the region. In particular, three regional databases estimate public investment based on national fiscal accounts: INFRALATAM (a joint effort by the IDB, CAF, and ECLAC); BDD/GIPAL (the IDB's fiscal division); and BOOST (an initiative of the World Bank).

INFRALATAM, developed jointly by the Inter-American Development Bank, CAF, and ECLAC, is one of the most comprehensive sources available for measuring public investment in economic infrastructure in Latin America and the Caribbean. The database covers 21 countries in the region for the period 2008–2023 and compiles budgetary information primarily from the three levels of government—national, regional, and local—as well as from public enterprises. INFRALATAM records capital expenditures allocated in public budgets, including investment in new infrastructure, expansions and improvements to existing assets, replacement of obsolete capital, and costs associated with pre-investment studies, thereby providing a comprehensive picture of public investment in economic infrastructure.

The Inter-American Development Bank's Latin American Public Investment Expenditure Database (BDD/GIPAL), developed by the Fiscal Management Division (FMM), provides detailed information on public expenditure for 16 countries in Latin America and the Caribbean for the period 2000–2023, with a cross-disaggregation by economic, institutional, and functional classification. This database also draws on budgetary information and is particularly useful for analyzing the evolution of public spending over time and its composition. However, it has two significant limitations for analyzing investment in economic infrastructure: first, it does not include spending by public enterprises; and second, investment is recorded for all public sector functions and institutions, not necessarily exclusively associated with economic infrastructure sectors, which makes it difficult to accurately identify investment in these sectors.

For its part, the World Bank's BOOST database provides detailed information on public investment in economic infrastructure, distinguishing between budgeted and actual spending, which is a significant advantage over other sources. However, its use in the regional context has significant limitations, as its coverage is restricted to approximately 60 economies worldwide and to a relatively limited and outdated period, spanning 2009 to 2017. These temporal and coverage restrictions limit its applicability for a comparative and up-to-date analysis of infrastructure investment in Latin America and the Caribbean.

Beyond the specific characteristics of each of the databases mentioned, in all cases estimating public investment in infrastructure requires cross-referencing budget information based on its economic classification and by purpose and function. Since there is no specific identifier for infrastructure investment in public accounts, it is possible that public investments affecting coverage and quality indicators are underestimated simply due to operational difficulties in identifying them. In particular, one area of special concern is spending on infrastructure maintenance, which is often classified as current expenditure, making it impossible to identify it as part of public investment. In contrast, in the case of private investment channeled through PPP schemes, annuity payments or committed amounts typically explicitly include this maintenance component.

Another limitation in measuring public investment in the region is linked to shortcomings in the coverage and quality of the information available for the various levels of government, particularly in countries where data sources report only information from the central government or where there are significant discrepancies between budgeted and actual figures. According to data from BDD/GIPAL, over the past 10 years, the region has shown budget execution rates for public investment spending ranging from 73% to 83%. Furthermore, budget execution reports that consolidate data across all levels of government are scarce, even though subnational investment is particularly relevant in federal countries. In many cases, moreover, comparing data across different levels of government is not straightforward, as specific expenditure line items—such as capital expenditures directed toward specific infrastructure sectors—are not available. Furthermore, consolidation exercises entail significant reductions in the transparency of the available information, which is essential for conducting focused analyses of infrastructure sectors that are often not properly identified. In practice, this makes it impossible to distinguish such spending from other capital expenditures (when viewed through an economic classification of spending) or from other program-related expenditures (when viewed through a functional classification—which, moreover, often does not allow for adequate sectoral breakdown) that do not necessarily have a direct link to infrastructure investments.

Finally, in some infrastructure subsectors, a significant portion of investments are made through public enterprises, whose expenditure data is often not properly incorporated into consolidated reports. This poses an additional problem, since the prominence of public enterprises in the region's various infrastructure sectors varies greatly depending on the sector and country under analysis.

Limitations in Measuring Private Investment in LAC

The situation regarding the measurement of private infrastructure investment is no simpler. Unlike public investment, private investment is not subject to a reporting or disclosure mandate, which makes it difficult to properly identify and measure. Therefore, the measurement of private investment must rely on alternative sources of information. Efforts to estimate this component have focused on both direct and indirect measurement approaches.

Beyond the specific characteristics of each of the databases mentioned, in all cases estimating public investment in infrastructure requires cross-referencing budget information based on its economic classification and by purpose and function.

PAGE 60

Indirectly, Fay et al. (2019) estimate total investment in infrastructure—both public and private—using the breakdown of the IMF's gross fixed capital formation indicator and the breakdown of the Construction and Civil Engineering component from the World Bank's International Comparison Program. Given the highly aggregated nature of these statistics, gross fixed capital formation is recorded by broad categories of assets and institutional sectors, making it difficult to specifically isolate investment directed toward economic infrastructure, especially within the Civil Engineering component, where a large portion of infrastructure projects is concentrated. Consequently, these sources do not allow for a clear distinction between investment in new infrastructure, asset replacement, major maintenance, or other types of capital formation, nor do they adequately capture the sectoral heterogeneity inherent in infrastructure, which limits their usefulness for detailed analysis of gaps, investment efforts, and planning needs in this area.

Addressing these shortcomings requires the development of new tools that are rarely used in the region, such as satellite accounts focused on infrastructure (Box 6). Using the available disaggregated data, Coremberg (2018) indicates in an exploratory study of Brazil, Argentina, and Mexico that the importance of infrastructure services and investment may be significantly underestimated.

Box 6.

Infrastructure Satellite Accounts: A Tool for Improving the Measurement of Investment and Services Provided

Traditional measurement of infrastructure in national accounts tends to focus on partial indicators, such as investment by the construction sector or the value added of industries classified as providers of infrastructure services. While these approaches are useful, they have significant limitations in comprehensively capturing the magnitude of infrastructure services (IS) actually produced and used in an economy, as well as their contribution to well-being, productivity, and economic growth.

The infrastructure satellite accounts (ISA) methodology offers a conceptually consistent alternative to overcome these limitations. Rather than focusing on enterprises based on their primary activity, the ISA focuses on the economic function of providing infrastructure services, thereby enabling a comprehensive measurement of both the supply and demand for such services, in full compliance with the System of National Accounts.

From the supply side, the ISA substantially expands the production frontier by incorporating infrastructure services provided on a self-account basis. This includes, for example, transportation carried out by companies with their own fleets, energy self-supplied by productive sectors, as well as services generated by households —particularly transportation using their own vehicles and energy self-supply. In this way, the ISA captures activities that have a real economic impact but remain invisible in traditional statistics, thereby avoiding distortions in the analysis of sectoral productivity and aggregate well-being.

Coremberg (2018) notes that the available empirical evidence for countries such as Argentina, Brazil, and Mexico shows that this self-produced infrastructure services sector accounts for an additional 3 to 4% of GDP, implying that the total contribution of infrastructure services to GDP has historically been underestimated by nearly one-third. In particular, self-provided transportation accounts for nearly 50% of the sectoral GDP of transportation as measured using the traditional approach, while measuring household transportation increases GDP by approximately 2%, in line with comparable international experiences.

From the demand perspective, the ISA also offers a more comprehensive view. Unlike the traditional approach, which focuses on infrastructure investment and final consumption of contracted services, the ISA incorporates both the consumption of infrastructure services provided by third parties and those generated on one's own account. It also redefines infrastructure investment by including not only civil engineering works but also transportation equipment, machinery, and capital goods—both domestic and imported— necessary for the provision of infrastructure services. Empirical applications show that, under this approach, investment associated with infrastructure services can reach levels close to 9% of GDP, compared to significantly lower figures when only investment in construction is considered.

Overall, the infrastructure satellite accounts approach highlights that both infrastructure investment and the actual provision of services have been systematically underestimated in conventional metrics. In the context of this study, the adoption—or at least the conceptual consideration—of this type of tool is particularly relevant for interpreting the observed discrepancies between progress in indicators of infrastructure service coverage and quality and the levels of investment reported by traditional sources.

Furthermore, private investment in economic infrastructure is measured directly using specialized databases that track the financing or contractual arrangements of infrastructure projects involving private participation; however, as will be shown below, the identification and measurement of this type of investment also have their own limitations.

One of the main sources of information is the World Bank's Private Participation in Infrastructure (PPI) database. This database focuses on tracking the amounts committed to the development of economic infrastructure projects with private participation, particularly those associated with public-private partnership (PPP) schemes. The database compiles detailed information on the contractual investment commitments associated with these types of schemes.

Among its advantages are its public accessibility and its broad geographic coverage, which extends beyond Latin America and the Caribbean. However, using it to estimate the private investment actually executed presents significant limitations. First, the PPI reports the total contractual amount of investment in economic infrastructure projects, including both the public and private components, which requires identifying and isolating the private contribution on a case-by-case basis. This is not always possible, as in some cases the information is not available due to a lack of disaggregation or the confidentiality of the contracts. Second, since it is a database focused exclusively on PPP projects financed through project finance structures and special purpose vehicles (SPVs), the PPI does not capture private investments made under corporate finance arrangements or other forms of private investment in public infrastructure. The database also suffers from a representativeness bias, as small-scale projects are difficult to identify in major media outlets or on government websites, which are the primary sources of information for this database. This limitation is particularly pronounced in sectors such as water and sanitation, where smaller-scale providers play a significant role.

Alternatively, specialized private databases, such as IJGlobal—along with others with similar characteristics—represent an alternative source of information for analyzing private investment in infrastructure and are considered among the best available for tracking project-based private investments (GI Hub, 2022). This database offers a higher level of detail at the project level, as it allows for the identification of the financial transactions involved in such operations—information that is not always available in publicly accessible databases. However, it also has structural limitations. In particular, transaction coverage is not exhaustive; there is a bias toward larger projects; and the information available on low- and middle-income countries is more limited than that for high-income economies. Furthermore, like the PPI database, these sources focus on private investments structured at the project level (project finance), and thus do not capture a significant portion of private investment carried out through corporate financing, which may represent a substantial share of total investment in certain infrastructure sectors operated by private providers (e.g., water utilities in some countries in the region).

Ultimately, the sources typically used to estimate private infrastructure investment are largely biased toward reporting financial transactions or contractual arrangements carried out through *project finance* instruments and in large-scale projects that are easily identifiable, which results in underreporting of the total investment amount. Furthermore, since these data report the total amount committed to or financed for infrastructure projects, the assumptions regarding how that amount can be interpreted in terms of investment flows are far from trivial. As a result, investments funded with equity capital by both users and infrastructure service concessionaires are rarely included in such estimates.

Addressing these shortcomings in the identification of infrastructure investment, as well as providing a solid foundation for interpreting these figures in terms of annual investment flows, is an important task for understanding the evolution of infrastructure gaps in the region. This paper presents evidence that there is indeed a divergence between the observed evolution of indicators of infrastructure service coverage and quality and what would be expected based on the best available data on investment in these sectors in the region. This divergence admits several explanatory channels. On the one hand, the temporal lag between the flow of investment and its maturation into effective services—which varies significantly across sectors (Box 1)—implies that part of the distance between reported investment and observed progress may simply be due to the timing of works. On the other hand, own-account investment by firms and households, whose magnitude is far from negligible (Box 6), suggests that a relevant share of the progress in coverage could stem from investments that are not reflected either in the estimated needs or in the investment series used. Identifying more precisely both the magnitude and the channels of this divergence is therefore essential for establishing productive policy dialogues.

The infrastructure satellite accounts approach highlights that both infrastructure investment and the actual provision of services have been systematically underestimated in conventional metrics.

PAGE 64

Concluding Remarks

The updated estimates presented in this document show that Latin America and the Caribbean have made real progress in terms of coverage and improvements in the quality of infrastructure services during the period analyzed. However, this progress is insufficient to achieve the targets associated with the Sustainable Development Goals within the originally established timeframe. In the absence of a substantial change in the current trajectory, the region would not be able to close the identified infrastructure gaps by 2030.

A key finding of the study is that the observed pace of improvement in coverage and quality indicators is difficult to reconcile with the levels of infrastructure investment reported by the available data sources, even under the assumption that investment is being implemented efficiently, without cost overruns or delays. In several countries, these investment levels—if taken as representative of the actual investment effort—would barely be sufficient to cover the replacement and maintenance costs of the existing infrastructure stock, making it difficult to explain the observed improvements in service provision.

The main hypothesis put forward in this study is that this divergence is largely explained by the underreporting of infrastructure investment. This underreporting is likely associated with structural challenges in properly identifying public investment across different levels of government and through state-owned enterprises, as well as with the lack of dedicated databases that comprehensively capture private infrastructure investment. In the latter case, the available information is often an incomplete approximation based on infrastructure financing data, which does not necessarily reflect the total investments actually made. Furthermore, the assumptions underlying how these commitments translate into annual investments are not trivial and could lead to different estimates of annual investment levels.

Establishing accurate and comparable levels of infrastructure investment is therefore a matter of paramount importance. Having more precise metrics is key not only for effective communication with policymakers but also for conducting more realistic project planning and budgeting exercises and for setting investment targets consistent with established development goals.

Closing this information gap requires progress in developing new measurement mechanisms. Among these, the following stand out: the incorporation of specific infrastructure investment identifiers into public accounts; the development of infrastructure satellite accounts within the framework of national accounts; and the creation of private investment databases that adequately represent small- and medium-sized projects, as well as those schemes that utilize other types of financing linked to corporate structures. Furthermore, to increase the comprehensiveness of private investment identification, efforts should be made to ensure that the data are not limited solely to project financing but also incorporate capital investments made by both concessionaires and service users themselves in public infrastructure projects. Advancing this agenda is essential for improving the quality of analysis and strengthening infrastructure decision-making in the region.

That said, the underreporting of investment is not the only possible explanation for this divergence. A complementary reading emerges from the evidence gathered in this study itself: the cost of closing each unit of the gap has been declining steadily. Low-earth-orbit satellite connectivity, analyzed in Box 2, and decentralized rural electrification solutions—mini-grid and individual systems—make it possible to provide access in generally more remote areas at a substantially lower cost; to this are added slower population growth and urbanization, which reduce the per-person cost of each connection. Consequently, part of the region's progress could be explained not only by investment being undervalued, but also because closing the gap is less costly today than it was five years ago.

Existing estimates indicate that, at the reported levels of investment, Latin America and the Caribbean would be unable to close the identified infrastructure gaps. It is therefore essential to confront these predictions with the observed empirical evidence. The history of scientific thought reminds us that, even when evidence contradicts dominant conceptual frameworks, its validity is not diminished. In this regard, the evidence compiled in this study shows that, despite investment levels that appear to fall short of estimated requirements, the region has made tangible—albeit insufficient—progress on several of the coverage and quality indicators considered. As Galileo Galilei is said to have remarked when acknowledging the primacy of empirical evidence over the dogmas of his time, "eppur si muove." The region is making progress, and understanding why it is doing so is a central issue for the design of public policies.

References

Briceño-Garmendia, C., and Foster, V. (2009). Africa's Infrastructure: A Time for Transformation. Africa Development Forum Series. World Bank, Washington, DC.

Brichetti, J. P., Mastronardi, L., Rivas, M. E., Serebrisky, T., and Solís, B. (2021). "The Infrastructure Gap in Latin America and the Caribbean: Investment Needed Through 2030 to Meet the Sustainable Development Goals." IDB Monograph 962. Inter-American Development Bank, Washington, DC.

Brichetti, J. P., Giraldez Zúñiga, F., Sánchez González, S., and Serebrisky, T. (2023). The Airport Infrastructure Access Gap in Latin America and the Caribbean. IDB Working Paper. Inter-American Development Bank, Washington, DC.

BRTData. Statistical Information by City.

Calderón, C., and Servén, L. (2004). The Effects of Infrastructure Development on Growth and Income Distribution. Policy Research Working Paper 3400. World Bank, Washington, DC.

Cavallo, E., and León-Gómez, C. (2026). Estimating Private Investment in Public Infrastructure Services in Latin American Countries. Mimeo. Inter-American Development Bank.

Cavallo, E., Powell, A., and Serebrisky, T., eds. (2020). *From Structures to Services: The Path to Better Infrastructure in Latin America and the Caribbean.* Development in the Americas Series. Washington, DC: Inter-American Development Bank.

Coremberg, A. (2018). The Satellite Account for Infrastructure Services: A New Way to Measure Infrastructure in Latin America Based on the Cases of Argentina, Brazil, and Mexico: Sources, Methods, and Results. IDB Technical Note 1502. Washington, DC: Inter-American Development Bank.

Energy Hub. Investment Gap for Universal Access to Electricity by 2030. Accessed September 2025.

Fay, M., and Yepes, T. (2003). Investing in Infrastructure: What Is Needed from 2000 to 2010? Policy Research Working Paper 3102. World Bank, Washington, DC.

Fay, M., Lee, H. I., Mastruzzi, M., Han, S., and Cho, M. (2019). Hitting the Trillion Mark. *A look at how much countries are spending on infrastructure*. Policy Research Working Paper 8730. The World Bank Group.

Galindo, L. M., Gómez, J. J., Alatorre, J. E., and Reyes, O. (2022). Energy transition and investment needs in Latin America and the Caribbean. Economic Commission for Latin America and the Caribbean (ECLAC).

GI Hub (2022). Infrastructure Monitor 2022. Global Infrastructure Hub (a G20 Initiative). https://www.gihub.org/infrastructure-monitor/

Hutton, G. (2024). *Urban Water Climate Resilience Costs* (background paper for *Banking on Cities*). World Bank.

Hutton, G., and Varughese, M. (2016). The Costs of Meeting the 2030 Sustainable Development Goal Targets on Drinking Water, Sanitation, and Hygiene. World Bank, Washington, DC.

Hutton, G., and Varughese, M. (2020). The Costs of Meeting the 2030 Sustainable Development Goal Targets on Drinking Water, Sanitation, and Hygiene: Updated Estimates and Policy Implications. World Bank.

International Road Federation. Statistics: Better Road Data for Better Policies.

International Telecommunication Union. Statistics.

IRENA (2025). *Renewable power generation costs in 2024*. International Renewable Energy Agency (IRENA). https://www.irena.org/-/media/Files/IRENA/Agency/Publication/2025/Jul/IRENA_TEC_RPGC_in_2024_2025.pdf

ITF (2023a). *The ITF Urban Passenger Model: Insights*. OECD Publishing. International Transport Forum.

ITF (2023b). *ITF Modeling Framework (PASTA): Methodological Documentation*. OECD Publishing. International Transport Forum.

ITU (2021). *Measuring Digital Development: Facts and Figures*. International Telecommunication Union.

Joint Monitoring Program. Statistical information.

Lentini, E. J. (forthcoming). Investment Needs for Sanitation in Latin American and Caribbean Countries. Calculation Model, Results, and Recommendations. Inter-American Development Bank, Washington, DC.

Mikou, M., Rozenberg, J., Koks, E., Fox, C., and Peralta Quiros, T. (2019). “Assessing Rural Accessibility and Rural Roads Investment Needs Using Open Source Data.” Policy Research Working Paper, No. 8746. World Bank, Washington, DC.

Perrotti, D. E., and Sánchez, R. J. (2011). La brecha de infraestructura en América Latina y el Caribe. Serie Recursos Naturales e Infraestructura No. 153. ECLAC, Santiago.

Peruvian Ministry of Economy and Finance (2019). “National Infrastructure Plan for Competitiveness.”

Peruvian Ministry of Housing, Construction, and Sanitation (2014). National Sanitation Sector Investment Plan 2014–2021.

Peruvian Ministry of Housing, Construction, and Sanitation (2017). National Sanitation Plan 2017–2021.

Rozas, P., and Sánchez, R. (2004). Desarrollo de infraestructura y crecimiento económico: revisión conceptual. Serie Recursos Naturales e Infraestructura No. 75 (LC/L.2182-P). ECLAC, Santiago.

Rozenberg, J., and Fay, M., eds. (2019). "Beyond the Gap: How Countries Can Afford the Infrastructure They Need While Protecting the Planet." Sustainable Infrastructure Series. World Bank, Washington, DC.

Salas, D., Zapata, M., and Guerrero, J. (2007). "Cost Model for Wastewater Treatment in the Region." *Scientia Et Technica*, December, vol. XIII, no. 037. Technological University of Pereira, Colombia.

Schmidt-Traub, G. (2015). Investment Needs to Achieve the Sustainable Development Goals: Understanding the Billions and Trillions. SDSN Working Paper. Sustainable Development Solutions Network.

Serebrisky, T., Brichetti, J.P., Blackman, A., and Mesquita Mosqueira, M. (2020). Sustainable and Digital Infrastructure to Drive the Post-COVID-19 Economic Recovery in Latin America and the Caribbean: A Path Toward More Jobs, Integration, and Growth. IDB Monograph; 832. Washington, DC: Inter-American Development Bank.

Straub, S. (2008). Infrastructure and Growth in Developing Countries: Recent Advances and Research Challenges. Policy Research Working Paper 4460. World Bank, Washington, DC.

World Bank (2025a). Banking on Cities: Investing in Resilient and Low-Carbon Urbanization. World Bank.

World Bank (2025b). Estimating the Costs of Resilient and Low-Carbon Urbanization (background paper for Banking on Cities). World Bank.

World Bank. Population Estimates and Projections.

World Bank. Road Costs Knowledge System (ROCKS).

World Bank. World Development Indicators.

World Health Organization and the United Nations Children's Fund (UNICEF) (2017). WASH in the 2030 Agenda: New Global Indicators for Water, Sanitation, and Hygiene.

World Health Organization. SDG 6.3.1 monitoring page. https://www.who.int/teams/environment-climate-change-and-health/water-sanitation-and-health/monitoring-and-evidence/water-supply-sanitation-and-hygiene-monitoring/country-files-for-sdg-6.3.1-proportion-of-wastewater-safely-treated

Yépez-García, A., Carvalho Metanias Hallack, M., Mejdalani, A., and López Soto, D. (2021). "Update on the Energy Path of Latin America and the Caribbean." Inter-American Development Bank, Washington, DC. Mimeo.

Yépez-García, A., Ji, Y., Carvalho Metanias Hallack, M., and López Soto, D. (2019). "The Energy Path of Latin America and the Caribbean." IDB Monograph 683. Inter-American Development Bank, Washington, DC.

ANNEX

Methodology for Calculating the Infrastructure Gap in Latin America and the Caribbean

A. General Aspects
B. Calculation of the Infrastructure Gap in the Electricity Sector
C. Calculation of the Infrastructure Gap in the Drinking Water And Sanitation Sector
D. Calculation of the Infrastructure Gap in the Telecommunications Sector
E. Calculation of the Infrastructure Gap in the Transportation Sector
F. Consolidated Results and Availability of Information by Country

This Annex describes the methodologies used to estimate the infrastructure gap in Latin America and the Caribbean (LAC) for achieving the SDGs by 2030. It also details the information sources used, as well as the main assumptions underlying the estimate.

A. GENERAL ASPECTS

This section of the Annex describes the calculation methodologies, information sources, and assumptions used for variables that affect calculations in more than one sector (demographic estimates, GDP projections, and general aspects of calculating investment in asset maintenance).

A.1. Demographic Estimates

Estimating the infrastructure gap for household services requires identifying the population that currently lacks coverage, as well as estimating the increase in demand expected by 2030 from population growth.

The demographic data used to make the estimates were obtained from the World Bank. This information is based on the World Population Prospects compiled by the United Nations Department of Economic and Social Affairs. This database provides population figures and other demographic estimates and projections from 1960 to 2050 for more than 200 economies, including population data broken down by age groups, sex, and geographic location (urban/rural), as well as data on fertility, mortality, and migration, among others.

Household service coverage indicators (water and electricity) are typically expressed as the share of households served. Converting the estimated populations into a number of households therefore requires data on average household size (inhabitants per household). To estimate the number of households, this study considered two different household sizes per country: one for the urban population and another for the rural population. The information used to calculate these household sizes is based on the population ratios reported in Brichetti et al. (2021).

The calculated household sizes remained constant throughout the entire study period. In this regard, it should be noted that a gradual decline in average household size is expected in the coming years, due to rising incomes and the urbanization process the region is undergoing. Therefore, the decision to hold it constant may introduce a downward bias in the estimates of gaps in household services. This is because using a household size higher than the actual one leads to an underestimation of the number of households requiring connection to these services. However, this effect is expected to be marginal, given that the trend in average household size is gradual and the period under analysis (2025–2030) is limited. Table A.1 summarizes the key demographic data used for the estimation.

Table A.1. *Demographic information by country used to estimate infrastructure gaps in LAC.*

Country	2024							2030					Increase in demand up to 2030	
	Total Population	Urban Population	Rural Population	Average house-hold size (Urban)	Average house-hold size (Rural)	Urban Dwellings	Rural Dwellings	Total Population	Urban Population	Rural Population	Urban D wellings	Rural Dwellings	Urban Dwellings	Rural Dwellings
Argentina	45,696,159	42,305,047	3,391,112	3.50	3.50	12,087,156	968,889	46,585,022	43,440,067	3,144,955	12,411,448	898,559	324,291	(70,331)
The Bahamas	401,283	336,131	65,152	3.30	3.30	101,755	19,723	410,267	347,586	62,681	105,223	18,975	3,468	(748)
Barbados	282,467	89,113	193,354	3.05	3.05	29,217	63,395	282,490	92,578	189,912	30,353	62,266	1,136	(1,129)
Belize	417,072	195,348	221,724	4.61	4.61	42,375	48,096	449,839	218,568	231,271	47,412	50,167	5,037	2,071
Bolivia	12,413,315	8,881,106	3,532,209	3.33	3.14	2,666,999	1,060,723	13,405,564	9,882,716	3,522,848	2,967,783	1,122,616	300,784	61,893
Brazil	211,998,573	186,592,664	25,405,909	2.92	3.15	63,901,597	8,700,654	216,074,411	192,906,913	23,167,498	66,064,011	7,357,750	2,162,414	(1,342,904)
Chile	19,764,771	17,415,926	2,348,845	3.01	3.01	5,786,022	780,347	20,233,183	17,974,957	2,258,226	5,971,747	750,241	185,725	(30,106)
Colombia	52,886,363	43,711,637	9,174,726	3.14	3.41	13,920,904	2,921,887	55,736,475	46,998,668	8,737,807	14,967,729	2,564,658	1,046,825	(357,229)
Costa Rica	5,129,910	4,266,392	863,518	3.13	3.13	1,363,065	275,884	5,251,497	4,505,154	746,343	1,439,346	238,448	76,282	(37,436)
Ecuador	18,135,478	11,793,320	6,342,158	3.58	3.88	3,294,223	1,771,553	19,069,719	12,725,605	6,344,114	3,554,638	1,634,514	260,415	(137,039)
El Salvador	6,338,193	4,816,773	1,521,420	3.43	3.68	1,404,307	443,563	6,486,207	5,134,027	1,352,180	1,496,801	367,696	92,494	(75,866)
Guatemala	18,406,359	9,855,133	8,551,226	4.01	5.18	2,457,639	2,132,475	20,067,253	11,322,546	8,744,707	2,823,578	1,688,462	365,938	(444,013)
Guyana	831,087	227,020	604,067	3.58	3.58	63,413	168,734	861,038	245,844	615,194	68,672	171,842	5,258	3,108
Haiti	11,772,557	7,119,101	4,653,456	4.75	4.98	1,498,758	979,675	12,552,359	8,149,368	4,402,991	1,715,656	884,474	216,898	(95,201)
Honduras	10,825,703	6,583,976	4,241,727	3.87	4.29	1,701,286	1,096,053	11,885,319	7,643,092	4,242,227	1,974,959	987,918	273,673	(108,136)
Jamaica	2,839,175	1,639,964	1,199,211	3.27	3.27	501,518	366,731	2,808,954	1,695,176	1,113,778	518,402	340,605	16,884	(26,126)
Mexico	130,861,007	107,125,438	23,735,569	3.49	3.83	30,694,968	6,801,023	136,904,738	114,316,825	22,587,913	32,755,537	5,893,718	2,060,569	(907,305)
Nicaragua	6,916,140	4,160,404	2,755,736	5.22	5.57	797,012	527,919	7,441,603	4,633,365	2,808,238	887,618	504,520	90,606	(23,398)
Panama	4,515,577	3,155,846	1,359,731	3.36	3.75	939,240	404,682	4,833,859	3,491,158	1,342,701	1,039,035	357,857	99,795	(46,825)
Paraguay	6,929,153	4,399,250	2,529,903	3.74	3.79	1,176,270	676,445	7,407,618	4,866,953	2,540,665	1,301,324	669,888	125,054	(6,557)
Peru	34,217,848	27,079,663	7,138,185	3.56	3.46	7,606,647	2,005,108	36,193,880	29,149,465	7,044,415	8,188,052	2,034,666	581,405	29,558
Dominican Republic	11,427,557	9,714,680	1,712,877	3.18	3.03	3,054,931	538,641	11,938,852	10,478,133	1,460,719	3,295,010	482,370	240,080	(56,270)
Suriname	634,431	422,106	212,325	3.90	3.90	108,232	54,442	665,652	450,081	215,571	115,405	55,275	7,173	832
Trinidad and Tobago	1,371,926	734,831	637,095	3.91	3.91	187,936	162,940	1,376,882	754,531	622,351	192,975	159,169	5,038	(3,771)
Uruguay	3,386,588	3,246,112	140,476	2.76	3.52	1,176,128	50,897	3,372,887	3,248,023	124,864	1,176,820	35,511	692	(15,386)
Venezuela	28,405,543	25,140,326	3,265,217	3.83	3.83	6,564,054	852,537	29,151,810	25,956,772	3,195,038	6,777,225	834,214	213,171	(18,323)
LAC	646,804,235	531,007,307	115,796,928	3.6	3.8	163,125,652	33,873,016	671,447,378	560,628,171	110,819,207	171,886,759	30,166,378	8,761,107	(3,706,638)
CID	206,610,075	156,993,091	49,616,984	39.05	42.05	43,953,580	13,248,011	217,811,526	169,892,236	47,919,290	47,474,953	11,455,631	3,521,372	(1,792,380)
CCB	6,360,369	3,449,165	2,911,204	21.01	21.01	992,073	835,965	6,405,283	3,585,796	2,819,487	1,031,030	808,132	38,958	(27,833)
CAN	146,058,547	116,606,052	29,452,495	17.44	17.72	34,052,826	8,611,808	153,557,448	124,713,226	28,844,222	36,455,427	8,190,667	2,402,600	(421,141)
CSC	287,775,244	253,958,999	33,816,245	15.93	16.97	84,127,173	11,177,232	293,673,121	262,436,913	31,236,208	86,925,350	9,711,948	2,798,177	(1,465,283)

A.2. GDP Projections

Although infrastructure gaps have been estimated in current dollars throughout the study, the results are also expressed as a percentage of GDP to illustrate the relative investment effort required to close the identified gaps. The GDP data used corresponds to those reported on the World Bank's World Development Indicators (WDI) webpage for the countries of the region[7]. According to that source, regional GDP in 2024 amounted to USD 6,724,524 million.

Furthermore, the gap calculation is a forward-looking exercise, which requires projections of the region's growth to characterize the investment effort. However, estimating the future economic growth of each country is beyond the scope of this study. Therefore, to make these projections, we used the official estimates of real GDP growth for Latin America and the Caribbean published by the International Monetary Fund in the World Economic Outlook (April 2025). Specifically, the real GDP growth rates projected by the International Monetary Fund (IMF) for 2025 and 2026—2.0% and 2.4%, respectively—were considered and used as the central assumption for characterizing the required investment effort. Additionally, sensitivity analyses were conducted by modifying the projected growth rate by ±20% relative to the baseline scenario defined based on these projections, with the aim of illustrating the impact this assumption may have on the investment effort needed to close the gaps.

The annual investment effort, expressed as a percentage of regional GDP, reported in this study is calculated using the following formula:

$$\bar{\beta} = \frac{1}{6} \sum_{t=2024}^{t=2030} \frac{I_t}{PBI_{2024}.\,(1+\gamma)^{t-2024}}$$

Where:

- $\bar{\beta}$: Annual investment effort (as a percentage of regional GDP)
- I_t : Total investment made each year to close the gaps
- PBI_{2024} : LAC GDP reported by the World Bank for 2024
- γ : Expected annual GDP growth rate

7 Updated as of January 2026.

A.3. General aspects of calculating investment in the maintenance and replacement of assets

The calculation of the gaps incorporates the costs of maintaining and replacing the infrastructure necessary to provide services. In this regard, two clarifications are necessary:

1. The maintenance costs included in the calculation were estimated as those required to keep infrastructure assets operating optimally throughout their expected useful life. The calculation also includes the investments required to replace assets once their expected useful life has ended. To determine the replacement profile of the existing asset stock, it was assumed that existing investments were made in a smooth manner, that is, without discontinuities in the investment process over time.
2. The investment required to cover maintenance costs is not independent of the investment profile assumed for closing infrastructure gaps. This study considers two alternative investment profiles for closing those gaps. The first assumes constant investment in nominal terms; that is, the same amount is invested each year. The second assumes that countries invest a constant share of GDP each year, which, given the expected rate of economic growth, implies increasing investment amounts over time. For the purpose of estimating the investment effort presented in this study, the first investment profile—namely, constant investment in nominal terms—has been adopted.

B. CALCULATION OF THE INFRASTRUCTURE GAP IN THE ELECTRICITY SECTOR

In this study, the infrastructure gap was estimated by considering two dimensions of electricity service: ensuring universal access to electricity and ensuring an adequate supply of electricity, considering estimates from the IDB's Energy Division.

B.1. Calculation of the Electricity Access Gap

To calculate the infrastructure gap and the investments needed to ensure universal access to electricity, it was necessary to define the target to be achieved in accordance with the relevant SDG, collect data on electricity access levels in urban and rural areas of each country, determine the unit costs of providing access, and establish a methodology for calculating the investment required for asset maintenance and replacement.

B.1.1. Defining the Target in Accordance with the Relevant SDG

The relevant SDG in this case is Goal 7, which states the need to "ensure access to affordable, reliable, sustainable, and modern energy for all." Consequently, the objective of closing access gaps is to ensure that 100% of urban and rural households have access to electricity by the year 2030.

B.1.2. Sources of Information for Electricity Access Indicators

For electricity service coverage, both urban and rural, the estimates were updated using information available on the IDB's EnergyHub. Specifically, the share of the total population with access to electricity for the year 2023—the most recent year for which data is available—was used. Based on this indicator, the number of people without access to electricity was estimated and subsequently converted to the number of households by applying the corresponding demographic assumptions. This procedure made it possible to estimate the number of urban and rural households without access to electricity, which was used in the gap analysis.

B.1.3. Unit Costs

To determine the unit costs of providing access to electricity to unconnected households, four relevant costs were identified related to the infrastructure solution deemed most appropriate: costs of connecting to the urban grid; costs of connecting to and expanding rural grids; costs of connecting to an isolated rural system configured as a *mini-grid*; and costs of connecting to an individual isolated rural system. Each of these costs was estimated at the national level.

The share of households requiring each type of solution was determined following the guidelines of the EnergyHub's study on estimating investment gaps for achieving universal access to residential electricity in Latin America and the Caribbean. By aggregating the various gaps identified at the country level, average costs were obtained at the regional level, which were subsequently adjusted for inflation over the 2018–2023 period, resulting in a unit cost of USD 1,009 per urban household and USD 2,414 per rural household.

B.1.4. Procedure for Calculating the Electricity Infrastructure Gap

The procedure for calculating and assessing the infrastructure gap to ensure access to electricity service was as follows:

- First, the number of households per country, both urban and rural, that lacked access to electricity was determined.
- Second, the projected growth in the number of households through 2030 was determined in line with projected population growth. This estimate was made by dividing the projected population increase by the average number of inhabitants per household by geographic area (urban/rural).
- Third, the number of households was multiplied by the corresponding unit cost; that is, the investments required to provide access to both current households without service and those projected through 2030 were calculated, differentiating the unit cost by urban or rural area.

B.1.5. Methodology for Determining Asset Maintenance and Replacement Costs

To estimate the investment required to maintain the grid in optimal condition, it was necessary to estimate the value of the existing infrastructure stock. Based on the available information, the number of households connected to the electric grid—in both urban and rural areas—was multiplied by the previously defined average unit costs. Additionally, the value of the infrastructure stock was depreciated using a straight-line method to account for the loss in value of the assets resulting from their use over time.

The annual investment required to cover asset replacement corresponds to annuities that replace the net value of existing assets, assuming a useful life of 30 years. Meanwhile, the cost of infrastructure maintenance was estimated using a rate of 2% per year of the estimated value of total assets, including new investments.

Because these values are model parameters, the estimates can be subjected to sensitivity analysis when the assumptions change.

B.2. Calculation of the Electricity Generation and Transmission Gap

Estimating the infrastructure gap in electricity generation and transmission required defining the target to be achieved in line with the corresponding Sustainable Development Goal, compiling projections on the increase in electricity demand, and estimating the associated investment needs.

B.2.1. Definition of the Target in Accordance with the Relevant SDG

The relevant SDG in this case is Goal 7, specifically Target 7.1 ("By 2030, ensure universal access to affordable, reliable, and modern energy services") and Target 7.2 ("By 2030, substantially increase the share of renewable energy in the energy mix"). In the absence of explicit quantitative targets for investments in transmission and generation, as well as quantification of the energy mix transition, we followed the investment pathway established in studies conducted by IDB specialists (Yepez-Garcia, Ji, Hallack, and Lopez Soto, 2019; Yepez-Garcia, Hallack, Mejdalani, and Lopez Soto, 2021). Based on countries' electricity generation expansion plans in LAC and projections of future electricity demand, those studies estimate the investment needs for the 2020–2030 period required both to expand generation capacity, in line with each country's energy policy objectives, and to replace generation plants that reach the end of their service life.

Generation expansion plans are typically reviewed periodically to ensure consistency with countries' Nationally Determined Contributions and other interim climate objectives, raising their ambition in line with the goals of the Paris Agreement. This suggests that countries may increase the share of renewable energy sources beyond what was originally planned in order to meet more ambitious climate commitments. Increasing the share of renewable energy generally affects not only investment in generation capacity but also the complementary investments required to ensure that the electricity grid can reliably accommodate the intermittency associated with these new generation sources. With respect to Target 7.2, it is worth noting that the modeling results indicate that the resulting electricity generation mix not only meets the projected electricity demand but also increases the share of non-conventional renewable energy in electricity generation in LAC from 7.9% to 17.1%. At the same time, the overall share of emissions-free electricity generation is estimated to increase from 63.4% to 70.4%. In the present update, this target is retained as the benchmark for estimating the electricity generation and transmission investment gap, consistent with the approach adopted by Brichetti et al. (2021).

Given the above, these investments should be treated as a minimum threshold in terms of climate change mitigation efforts, since the scenario developed may not be fully aligned with Goal 2 of the Paris Agreement, which is to "hold the increase in the global average temperature well below 2°C above pre-industrial levels, and to pursue efforts to limit the temperature increase to 1.5°C above pre-industrial levels (...)". This is because the estimates are not directly linked to a scenario of deep decarbonization of economies toward net-zero emissions, nor do they consider the electrification of various components of demand currently met by more polluting sources (which will require greater power capacity), nor do they account for investments in technology upgrades or other reduction efforts involving other energy sources, such as in the industrial or transportation sectors.

B.2.2. Sources of Information for Determining the Expected Increase in Electricity Demand

In the original estimate of the infrastructure gap in electricity generation and transmission (Brichetti et al., 2021), the expected electricity demand was determined following the guidelines set forth in Yepez-Garcia, Ji, Hallack, and Lopez Soto (2019) and their recent update by Yepez-Garcia, Hallack, Mejdalani, and Lopez Soto (2021). In these studies, the estimation of future electricity demand was carried out using an econometric method that employs the main determinants of electricity demand identified in the literature (GDP, oil price, electricity price, among others) as inputs and calibrates the parameters on the 1971–2019 historical period.

The original study used the electricity demand estimates from Yepez-Garcia, Hallack, Mejdalani, and Lopez Soto (2021), which predict an annual increase in regional electricity demand of 2.8%. This scenario exceeds the increases in electricity demand in the region over the past decade (1.8% annually on average). The reasons why projected demand exceeds the historical average are linked to the trend toward electrification of activities in the region, the projected increase in GDP—which affects electricity consumption in a nonlinear manner—and the expectation that the trend toward closing gaps in access to electricity will continue over the next decade. As a result, achieving universal access to electricity services will require expanding generation capacity to meet the growing demand.

This update retains the original electricity demand growth trajectory as the reference scenario. The available evidence indicates that, following the decline recorded in 2020 as a result of the pandemic, electricity demand quickly resumed a growth trajectory consistent with the projections considered, which allows us to assume—for the purposes of calculating the remaining gap toward 2025–2030—that the projected path constitutes a reasonable approximation of the observed behavior.

B.2.3. Estimates of Investment Needs to Close Infrastructure Gaps in Electricity Generation and Transmission

The estimate of investment needs to close the infrastructure gap in electricity generation and transmission in the original study (Brichetti et al., 2021) was based on the estimates provided in Yepez-Garcia, Hallack, Mejdalani, and Lopez Soto (2021).

The procedure used by the authors regarding generation was as follows:

- First, the investment required to meet the available electricity expansion plans of the countries in the region through 2030 was assessed; this calculation was performed for each country and for each generation technology, valuing the expansions expressed in terms of capacity, in accordance with the unit prices reported by the U.S. National Renewable Energy Laboratory (NREL).
- Second, the additional electricity generation needs were calculated to bridge the gap between the demand estimated using econometric models and the average generation resulting from installed capacity according to the objectives of the expansion plans for the 2020–2030 period. Taking into account each country's sectoral policies, the additional electricity generation needs by technology were estimated based on the composition of the generation mix in the expansion plans through 2030 (or the final year of the plan, as applicable). By using average load factors from the NREL model, the need for new generation by technology is converted into requirements for new capacity to be installed each year. Finally, this need for additional generation is valued using the unit prices reported by NREL.
- Third, a plant-level analysis was conducted to estimate the investment needs associated with the depreciation of the existing generation stock. This is done by identifying the estimated end of useful life of each plant by technology and calculating the replacement cost of all installed capacity reaching the end of its useful life during the 2020–2030 period.

Regarding transmission, the authors used the following procedure:

- The estimate was made by calculating a regional historical average of transmission grid expansion needs per GWh of demand.
- By multiplying this coefficient by the projected increase in electricity demand, the authors obtained the additional number of kilometers of high-voltage transmission lines required to provide the service.
- The valuation of this infrastructure was performed using the cost per kilometer of 400 kV transmission line derived from the World Bank's META model[8].

Finally, two additional cost scenarios for the new infrastructure were estimated to quantify the impact of projected cost reductions for non-conventional renewable energy generation (solar, wind, and biofuels) over the next decade. The first scenario was constructed based on the observed variation in total installed costs reported by the International Renewable Energy Agency (IRENA, 2025) in its most recent publication, applying this trend to the projection period. The second scenario maintains the original document's interpretation regarding a context of more pronounced cost reductions, preserving the gap in percentage points between the two scenarios and applying it to the updated values.

In the update exercise, and in the absence of more recent information that would allow for a full replication of the original procedure, the working assumption is that the expansion path for electricity generation and transmission evolved as projected in the baseline estimate (Brichetti et al., 2021). Under this assumption, the structure, parameters, and objectives of the original model are maintained to estimate the remaining investment needs through the analysis horizon (2025–2030).

C. CALCULATION OF THE INFRASTRUCTURE GAP IN THE DRINKING WATER AND SANITATION SECTOR

Based on the JMP definitions, this study estimated the infrastructure gap for: i) ensuring access to safely managed drinking water, ii) ensuring access

8 The Model for Electric Power Technology Assessment (META) was developed by Chubu Electric Power Corp. Inc. and Economic Consulting Associates, commissioned by the World Bank's Energy Sector Management Assistance Program (ESMAP). META provides cost and performance data for various electricity generation, transmission, and distribution technologies, taking into account market trends and the latest technological developments.

to safely managed sanitation, and iii) achieving wastewater treatment in urban areas.

C.1. Calculation of the infrastructure gap for access to safely managed drinking water

To calculate the infrastructure gap and the investment needed to ensure universal access to safely managed drinking water services, it was necessary to define the target to be achieved in accordance with the corresponding SDG, collect information on water access levels (according to different service standards in urban and rural areas), determine the unit costs of providing access, and define the procedure for calculating the gap and a methodology for calculating the investment required for asset maintenance and replacement.

C.1.1. Defining the Target in Accordance with the Relevant SDG

The relevant SDG in this case is Goal 6, specifically Target 6.1, which states the need to "achieve universal and equitable access to safe drinking water at an affordable price for all." Consequently, the objective of closing access gaps is to ensure that 100% of urban and rural households have access to safely managed water services by 2030.

C.1.2. Sources of Information for Drinking Water Service Access Indicators

For drinking water service coverage in Latin America and the Caribbean, official data from the JMP were used directly. Specifically, the shares of the total population with access to basic and safely managed drinking water services were used, as well as the corresponding shares for the urban population, based on the latest available data. These indicators served as the basis for estimating the population and households with and without access to drinking water services under the various standards considered in this analysis.

C.1.3. Unit Costs

To update the unit costs of providing access to drinking water services under the various service delivery standards, the original estimate from Brichetti et al. (2021) was used as a starting point. In that study, unit costs were defined based on an analysis of multiple projects and sectoral studies, including Peru's National Infrastructure Plan, the Dominican Republic's National Infrastructure Plan, estimates of infrastructure gaps for the countries of the Andean Community, as well as information provided by IDB specialists based on operational projects in countries such as Panama and Paraguay. The unit costs reported in Hutton and Varughese (2016), prepared by the World Bank, were also considered. For a detailed description of the sources and the procedure used for the original estimation of unit costs, see Brichetti et al. (2021).

On this basis, the unit costs defined in the original exercise were updated through an inflation adjustment for the period between 2018 and 2024, using the U.S. Consumer Price Index. The resulting average regional connection costs per capita, used to quantify the investment gap in the drinking water sector, are USD 443 for basic urban access, USD 582 for safely managed access in urban areas, USD 180 for basic rural access, and USD 547 for safely managed access in rural areas.

C.1.4. Methodology for calculating the gap in access to safely managed drinking water

The procedure for calculating and assessing the infrastructure gap to ensure access to safely managed drinking water was as follows:

- First, the number of households per country—both in urban and rural areas—with basic access to safe drinking water and with access to safely managed drinking water was determined, in accordance with JMP definitions. Additionally, the number of households without a drinking water service meeting any of the aforementioned standards was estimated.
- Second, the projected growth in the number of households through 2030 was determined in line with projected population growth. This estimate was calculated by dividing the projected population increase by the average number of people per household by geographic area (urban/rural).
- Third, the number of households requiring access was multiplied by the corresponding unit cost. For new households resulting from expected population growth and for those lacking basic drinking water service, the cost of a new, safely managed drinking water connection was used. For households that had only basic access to water, an improvement cost was considered, calculated as the

difference between the cost of a connection to a safely managed water service and the cost of a basic water connection.

C.1.5. Methodology for Determining Asset Maintenance and Replacement Costs

To estimate the investment required to maintain drinking water services in optimal condition, it was necessary to estimate the value of the existing infrastructure stock. Based on the available information, the number of households categorized by connection type (basic water, safe water), in both urban and rural areas, was multiplied by the previously defined unit costs. Additionally, the value of the infrastructure stock was depreciated using a straight-line method to account for the loss in value of the assets resulting from their use over time.

The annual investment required for asset replacement corresponds to annuities that replace the net value of existing assets, assuming a useful life of 30 years. Meanwhile, the cost of infrastructure maintenance was estimated using a rate of 2% per year of the estimated value of total assets, including new investments.

Because these values are model parameters, the estimates can be subjected to sensitivity analysis when the assumptions change.

C.2. Calculation of the Gap in Access to Safely Managed Sanitation

To calculate the infrastructure gap and the investments needed to ensure access to safely managed sanitation services, it was necessary to define the target to be achieved in accordance with the relevant SDG, collect information on access to sanitation (according to different service standards in urban and rural areas), determine the unit costs of providing access, and establish the procedure for calculating the gap and a methodology for calculating the investment required for asset maintenance and replacement.

C.2.1. Defining the Objective in Accordance with the Relevant SDGs

The relevant SDG in this case is Goal 6, specifically Target 6.2, which states the need to “achieve access to adequate and equitable sanitation and hygiene services for all and end open defecation, paying special attention to the needs of women and girls and people in vulnerable situations." Consequently, the objective of closing access gaps is to ensure that 100% of urban and rural households have access to safely managed sanitation services by 2030.

C.2.2. Sources of Information for Sanitation Service Access Indicators

In the case of sanitation service coverage in Latin America and the Caribbean, official data from the JMP were used directly. Specifically, the shares of the population with access to basic and safely managed sanitation services were used, based on the latest available data. These indicators served as the basis for estimating the population and households with and without access to sanitation services under the various standards considered in this analysis.

C.2.3. Unit Costs

Two main sources were used to update the unit costs of providing access to sanitation services under the various service delivery standards. First, for urban areas, information was drawn from Lentini (forthcoming), a document soon to be published by the Inter-American Development Bank that provides an in-depth analysis of the sanitation sector in Latin America and the Caribbean and presents unit costs disaggregated by type of technological solution and city size. Second, for rural areas, the analysis was based on the original estimate from Brichetti et al. (2021). In that study, unit costs were determined based on an analysis of multiple projects and sectoral studies, including Peru's National Infrastructure Plan, the Dominican Republic's National Infrastructure Plan, estimates of infrastructure gaps for the countries of the Andean Community, as well as information provided by IDB specialists based on operational projects in countries such as Panama and Paraguay. For a detailed description of the sources and the procedure used for the original estimation of unit costs, see Brichetti et al. (2021). Finally, the orders of magnitude of the unit costs considered for both the urban and rural sectors were validated against those reported in Hutton and Varughese (2016), a World Bank study documenting the costs of providing sanitation services under different quality standards for a broad set of countries in Latin America and the Caribbean.

On this basis, for urban areas, the regional average cost per inhabitant reported in Lentini (forthcoming) is used, which amounts to USD 842 for basic urban access and USD 1,027 for safely managed access. For rural areas, the study uses the unit costs defined by Brichetti et al. (2021), updated with an inflation adjustment for the period 2018–2024 using the U.S. Consumer Price Index, resulting in values of USD 655 for basic rural access and USD 918 for safely managed access in rural areas.

C.2.4. Procedure for Calculating the Safe Sanitation Infrastructure Gap

The procedure for calculating and assessing the infrastructure gap to ensure access to safely managed sanitation was as follows:

- First, the number of households per country, both in urban and rural areas, with basic access to sanitation and with access to safely managed sanitation was determined, in accordance with JMP definitions. Additionally, the number of households without a sanitation service meeting any of the aforementioned standards was estimated.
- Second, the projected growth in the number of households through 2030 was determined in line with projected population growth. This estimate was calculated by dividing the projected population increase by the average household size for each geographic area (urban/rural).
- Third, the number of households was multiplied by the corresponding unit cost. For new households resulting from expected population growth and for those lacking basic sanitation services, the cost of a new connection to a safely managed sanitation system was used. For households that had only basic access to sanitation, an improvement cost was considered, calculated as the difference between the cost of a connection to a safely managed sanitation service and the cost of a basic sanitation solution.

C.2.5. Methodology for Determining Asset Maintenance and Replacement Costs

To estimate the investment required to maintain sanitation services in optimal condition, it was necessary to estimate the value of the existing infrastructure stock. Based on the available information, the number of households categorized by type of solution (basic, safe), in both urban and rural areas, was multiplied by the previously defined unit costs. Additionally, the value of the infrastructure stock was depreciated using a straight-line method to account for the loss in value of the assets resulting from their use over time.

The annual investment required to cover asset replacement corresponds to annuities that replace the net value of existing assets, assuming a useful life of 30 years. Meanwhile, the cost of infrastructure maintenance was estimated using a rate of 2% per year of the total value of the assets—including new investments—based on the maintenance cost estimates reported by specialists from the Water and Sanitation Division in Panama.

Because these values are model parameters, the estimates can be subjected to sensitivity analysis when the assumptions change.

C.3. Calculation of the wastewater treatment gap

To calculate the infrastructure gap and the investments needed to ensure wastewater treatment, it was necessary to define the target to be achieved in accordance with the relevant SDG, collect information on the current level of wastewater treatment, determine unit costs, and establish the procedure for calculating the gap.

C.3.1. Defining the Target in Accordance with the Relevant SDGs

The relevant SDG in this case is Goal 6, specifically Target 6.3, which states the need to "improve water quality (...) by halving the proportion of untreated wastewater (...)". Nevertheless, for the calculation of the infrastructure gap, we have assumed that, by 2030, all wastewater generated by the population in urban areas in LAC must be treated at a treatment plant. This exceeds the target set in Target 6.3; however, it is consistent with Target 6.1, which calls for universal access to safely managed sanitation, and also contributes to the achievement of other SDGs, such as those related to the conservation of life below water (SDG 14), the sustainability of cities (SDG 11), and actions related to climate change (SDG 13).

C.3.2. Sources of Information for Wastewater Treatment Indicators

Regarding the level of wastewater treatment in LAC, this study uses data reported by the World Health Organization on the SDG 6.3.1 tracking page.

It should be noted that each country's profile was verified to determine the national share of treatment via treatment plants (excluding septic tanks). The share of treatment in urban areas was then calculated on the assumption that all plant-based treatment occurs exclusively in urban areas.

Data on wastewater treatment levels are available for the following countries: Argentina, Brazil, Chile, Colombia, Ecuador, El Salvador, Mexico, and Peru. There is no reasonable basis for assigning wastewater treatment percentages to countries with missing data; therefore, it must be assumed that this aspect of the estimate underestimates the wastewater treatment gap. The impact of this data limitation is small, as the countries included in the calculation account for 80% of the LAC population in 2030.

C.3.3. Unit Costs

To quantify the unit costs of providing wastewater treatment, cost data, expressed in dollars per capita, were compiled for various technologies. A review of the relevant literature has identified five types of technology, ranked by average cost: i) lagoons, ii) UASB[9], iii) primary treatment, iv) trickling filters, and v) activated sludge.

Unit cost data by technology were compiled from the document "Cost Model for Wastewater Treatment in the Region," published by Salas et al. (2007). These costs were adjusted for inflation to 2024 prices.

Peru's "National Sanitation Plan 2017–2021" and "National Sanitation Sector Investment Plan 2014–2021" were also reviewed; these documents include a unit cost that is not broken down by technology and whose value exceeds that considered in this study.

Furthermore, for the calculation of the wastewater treatment infrastructure gap, it is assumed that each of the technological solutions will contribute in equal proportion to closing the wastewater treatment infrastructure gap. Both the unit costs and the share of each technology within the technological mix used by each country are model parameters; therefore, it is possible to conduct a sensitivity analysis of the estimates in response to changes in the assumptions.

9 Upflow Anaerobic Sludge Blanket (UASB) Reactor.

C.3.4. Procedure for Calculating the Infrastructure Gap and Investment Needs for Wastewater Treatment

The procedure for calculating and assessing the infrastructure gap to ensure wastewater treatment was as follows:

- First, the number of people in urban areas whose wastewater is currently untreated was determined, based on the projected population through 2024. This was calculated by difference, since the percentage of the urban population with treated wastewater is known.
- Second, to calculate the current wastewater treatment infrastructure gap, the urban population without treatment was multiplied by the average unit cost (expressed in USD per capita), assuming that each technological solution contributes equally to closing the treatment gap.
- Third, to calculate the investment required to treat the wastewater that will be generated as a result of population growth, the average unit cost of treatment was multiplied by the increase in the urban population between 2024 and 2030.

D. CALCULATION OF THE INFRASTRUCTURE GAP IN THE TELECOMMUNICATIONS SECTOR

This study estimated the infrastructure gap in relation to two dimensions of telecommunications service: ensuring access to residential broadband services and ensuring access to mobile telecommunications.

D.1. Calculation of the Gap in Access to Telecommunications Services

To calculate the infrastructure gap for ensuring access to telecommunications services, it was necessary to define the target to be achieved in accordance with the relevant SDG, collect information on access to telecommunications services according to different technologies and service standards, determine the relevant unit costs, define the procedure for calculating the gap, and establish a methodology for calculating the investment required for asset maintenance and replacement.

D.1.1. Definition of the Objective in Accordance with the Relevant SDG

The relevant SDG is Goal 9, and specifically Target 9.c, which highlights the need to "significantly increase access to information and communications technology and strive to provide universal and affordable Internet access in the least developed countries." In this case, because the SDGs do not provide a clear target to be achieved, this study will define the gap in relative terms compared to the access provided in developed countries through two technologies: home broadband and mobile internet access under the 4G standard.

D.1.2. Sources of Information on Indicators of Access to Residential Broadband Services and Mobile Telecommunications Services Under 3G, 4G, and 5G Standards

The information used to characterize coverage in the telecommunications sector comes from two main sources. For fixed broadband service coverage in households, the indicator of the number of fixed broadband connections per 100 inhabitants was used, as reported in the World Bank's ***World Development Indicators*** (WDI) for the year 2023. Meanwhile, information regarding the coverage of 3G, 4G, and 5G mobile networks was obtained from the databases of the ***International Telecommunication Union*** (ITU),which report the coverage of these services for the year 2024.

D.1.3. Unit Costs

To update the unit costs of providing access to telecommunications services, we used the unit costs defined in the original study estimating infrastructure gaps for Latin America and the Caribbean. In that study, costs were estimated based on information from sectoral studies and infrastructure projects relevant to the region, including Peru's National Infrastructure Plan, the Dominican Republic's National Infrastructure Plan, and infrastructure gap estimates for the countries of the Andean Community, as well as an analysis of projects with different geographic, demographic, and technological characteristics. Since telecommunications coverage indicators are expressed in terms of population covered, unit costs were defined as infrastructure costs per covered inhabitant, with the aim of capturing, in a concise manner, the heterogeneity of provision costs associated with different urban and rural environments. For a detailed description of the sources and the procedure used for the original estimation of unit costs, see Brichetti et al. (2021).

On this basis, the unit costs used in this exercise were adjusted for inflation between 2018 and 2024, using the U.S. Consumer Price Index, to express them in monetary values consistent with the document's base year. For fixed broadband technologies and 3G and 4G mobile networks, this procedure involved directly updating the unit costs from the original estimate.

Fifth-generation (5G) mobile networks were not explicitly considered in the original study. Consequently, for this exercise, it was necessary to specifically estimate the unit cost associated with providing access to 5G networks, using a methodology designed to capture the incremental cost relative to already deployed 4G networks. The analysis began with the unit cost of providing access to 4G networks and applied two adjustment factors. The first captures the increase in capital and operating costs (CAPEX and OPEX) associated with the deployment of 5G networks, which, according to McKinsey & Company (2018), can reach up to 2.1 times the costs of 4G networks. The second reflects the increase in the density of base stations needed to deploy 5G networks, estimated at between 2.7 and 3.5 times the number of antennas required for 4G networks, according to technical information cited in an IDB study for the year 2020 (García Zeballos et al., 2020). The combination of these two factors captures both the higher unit cost per antenna and the greater number of antennas required, yielding an estimate of the total incremental cost of the migration from 4G to 5G.

As a result of this procedure, the per-capita unit costs used to quantify the investment gap in the telecommunications sector amount to USD 267 for providing access to 3G mobile networks, USD 267 for upgrading from 3G to 4G, USD 533 for providing access to 4G mobile networks, USD 2,030 for upgrading from 4G to 5G, and USD 2,563 for providing access to 5G mobile networks. In the case of fixed broadband in households, unit costs are estimated based on country-specific values, consistent with the updated costs used in the exercise.

D.1.4. Procedure for Calculating the Telecommunications Infrastructure Gap

The procedure for calculating and assessing the telecommunications infrastructure gap is the sum of the gaps identified in residential broadband service and in 3G, 4G, and 5G mobile services.

The procedure for determining the infrastructure gap in residential broadband service was as follows:

1. First, the difference was determined between the number of inhabitants per country with access to residential broadband service and the number of inhabitants required to reach the coverage levels of the *benchmark* countries (the median of Asian countries as determined in the Dominican Republic's infrastructure gap study). In countries where access levels were higher than those of the benchmark countries, it was determined that short-term investment to provide additional coverage was not necessary.
2. Second, based on projected population growth through 2030, the study determined how many new residents would need access to residential broadband service to reach the coverage levels of benchmark countries. Where the country's coverage level already exceeded that of the benchmark countries, it estimated the number of residents who would need to be guaranteed access in order to maintain current coverage levels.
3. Third, the number of residents requiring access to residential broadband services—as estimated in steps (1) and (2)—was multiplied by the respective unit cost.

Meanwhile, the procedure for determining the infrastructure gap in mobile telecommunications services under the 4G and 5G standards was as follows:

1. First, the number of residents per country with access to telecommunications under 3G, 4G, and 5G standards was determined.
2. Second, based on projected population growth through 2030, the number of residents requiring access to 4G and 5G telecommunications services was determined in order to achieve the coverage levels of the benchmark countries (Asian countries, as reported in the Dominican Republic's infrastructure gap study for 4G, and Asian countries based on our own calculations using ITU data for 5G).
3. Third, the number of residents who already had access to 4G and 5G communications networks in 2020 was subtracted from the number of residents determined in (2).
4. To calculate the gap, the following cost allocations were made: a) Residents who had 3G network coverage but not 4G coverage were allocated the unit cost of upgrading from 3G to 4G, as reported in the preceding section; b) the remaining population—necessary to reach

the 4G coverage level defined in subsection (2) and not covered by the calculation in subsection (a)—was allocated the unit cost of directly providing the 4G service; c) once the gap required to achieve coverage under the 4G standard was calculated, the remaining population that—while already having access to 4G networks—did not meet the 5G coverage level defined in subsection (2) was identified; d) This difference in population was allocated the unit cost of the upgrade from 4G to 5G or, where applicable, the unit cost of directly providing the 5G service, as reported in the preceding section.

D.1.5. Methodology for Determining Asset Maintenance and Replacement Costs

To estimate the investment required to maintain telecommunications services in optimal condition, it was necessary to estimate the value of the existing infrastructure stock. Based on the available information, the number of residents covered by the various services (residential broadband, 3G, 4G, and 5G telecommunications) was multiplied by the previously defined unit costs. Additionally, the value of the infrastructure stock was depreciated using a straight-line method to account for the loss in value of the assets resulting from their use over time.

The annual investment amounts required to cover asset replacement correspond to annuities that allow for the replacement of the net value of existing assets. For this purpose, a useful life of 15 years was used for the assets, reflecting the rapid obsolescence of some assets within this sector. Meanwhile, the cost of infrastructure maintenance was estimated using a rate of 2% per year of the estimated value of total assets, including new investments.

Because these values are model parameters, the estimates can be subjected to sensitivity analysis when the assumptions change.

E. CALCULATION OF THE INFRASTRUCTURE GAP IN THE TRANSPORTATION SECTOR

This study estimated the infrastructure gap in relation to three dimensions of transportation service: ensuring rural populations' access to the road network, providing adequate logistics infrastructure, and ensuring access to adequate and sustainable mass transit.

E.1. Calculation of the Infrastructure Gap in Rural Population Access to the Road Network

To calculate the infrastructure gap and the investments needed to ensure rural populations' access to the road network, it was necessary to define the target to be achieved in accordance with the relevant SDG, collect data on rural populations' access to the road network, determine unit costs, and establish the procedure for calculating the gap and the methodology for calculating the investment required for asset maintenance and replacement.

E.1.1. Defining the Target in Accordance with the Relevant SDG

The relevant SDG is Goal 9, specifically Target 9.1, which states the need to "develop reliable, sustainable, resilient, and quality infrastructure, including regional and cross-border infrastructure, to support economic development and human well-being, with a particular emphasis on affordable and equitable access for all." A key indicator for this target is the proportion of the rural population with access to a road passable year-round and under all weather conditions within 2 km, as measured by the RAI.

For the purposes of this study, the goal is to ensure year-round passability of the existing tertiary road network and to increase its coverage in line with its historical expansion by the year 2030.

E.1.2. Information Sources for Determining the Length and Passability of Primary, Secondary, and Tertiary Road Networks

The primary source of information for determining the length of the primary, secondary, and tertiary road networks was the IRF databases. These databases provide reasonably up-to-date information (from 2016 onward) on the length and degree of paving of road networks for 18 countries in the region. The databases do not provide information on the condition of the roads or their passability throughout the year.

Additionally, the IRF information was supplemented with data collected from national public sources, with the aim of validating and, if necessary, correcting the information used in the analysis. As a result of this process, a consistent, cross-country comparable dataset on the length and composition of road networks, including the length of highways, major or national roads, secondary or regional roads, other roads, the total length of the network, the percentage of the network that is paved, as well as the total kilometers of paved and unpaved roads.

E.1.3. Unit Costs

To estimate the unit costs of construction and maintenance of road networks, this study uses version 2.3 of the World Bank's ***Road Costs Knowledge System (ROCKS)*** database as its primary source. This database compiles information on unit costs for construction, routine maintenance, and periodic maintenance of road networks, broken down by road type and region, based on the systematization of thousands of projects financed by multilateral development banks (MDBs) in low- and middle-income countries.

Since the values reported in this database are expressed in constant 2000 dollars, they were updated to end-of-2023 dollars through an inflation adjustment using the U.S. Consumer Price Index, obtained from the World Bank's *World Development Indicators*. The update factor applied was 1.8292. This procedure allows unit costs to be expressed in monetary values consistent with the year of the road transport study, while maintaining the relative cost structure among the different types of road infrastructure projects.

As a result, the unit costs used to quantify the investment gap in the road sector, expressed in dollars per kilometer, are as follows: USD 1,856,581 for widening paved roads from two to four lanes, USD 1,394,971 for constructing two-lane paved roads, USD 563,072 for upgrading unpaved roads to paved roads, and USD 61,952 for constructing or rehabilitating gravel roads. In terms of maintenance, the unit costs used amount to USD 9,919 and USD 75,701 per kilometer for routine and periodic maintenance of four-lane paved roads, USD 4,960 and USD 37,850 per kilometer for two-lane paved roads, and USD 2,480 and USD 24,685 per kilometer for routine and periodic maintenance of gravel roads, respectively.

E.1.4. Procedure for Calculating the Rural Access Gap to the Road Network

To calculate the rural access gap to the road network, multiple calculations and assumptions were made, depending on the information regarding the condition and passability of the roads.

For countries without information on the condition of their roads and their passability, the procedure was as follows:

- Given that information was available on the total length of the network and the percentage of paved roads, the number of paved kilometers in each country's total road network was determined. Since most of the paved kilometers are part of the primary and secondary networks, it was assumed that these roads did not require maintenance to ensure their year-round passability.
- By difference, the number of unpaved kilometers in the total road networks was obtained as a residual. With regard to these, the following assumptions were made for the calculation and assessment of the gap: i) 30% of the unpaved network did not require any interventions to ensure its passability, ii) 40% of the unpaved network required urgent periodic maintenance to ensure its passability, and iii) 30% of the unpaved network required reconstruction to ensure its passability throughout the year[10].
- Finally, the cost of expanding the road networks in line with their historical growth was calculated; this includes a 10% increase in total mileage by 2030; the paving (two-lane) of 10% of the existing unpaved network by 2030; and the *upgrade* of 5% of the paved network (two-lane roads) to highways (four-lane paved roads) to meet increases in demand.

The values mentioned above are model parameters, so it is possible to perform a sensitivity analysis of the estimates in response to changes in the assumptions.

For countries with information on road conditions and passability, a similar process was carried out, taking the following into account:

- If the reported road condition was good/very good, no interventions were planned.
- If the condition was fair, it was considered that urgent periodic maintenance was required.
- If the condition was poor/very poor, the cost of reconstruction was considered.
- The criteria for road network expansion remained constant for the group of countries for which no information on the condition of the road network was available.

10 It should be noted that the World Bank's analysis assumes that a high percentage of unpaved roads (particularly the kilometers of roads belonging to the tertiary network) does not guarantee passability according to the World Bank's Rural Access Index (RAI) standards. To this end, the analysis was supplemented with the calculation of a self-developed rural road access indicator, inspired by that concept (see Box 4).

E.1.5. Methodology for Determining Maintenance and Replacement Costs of Assets

To estimate the investment required to maintain the road network in optimal condition, it was necessary to estimate the value of the existing infrastructure stock. Using unit costs and the total length of the various types of road networks by country, a value was obtained that was depreciated using a straight-line method to account for the loss of asset value resulting from their use over time.

Likewise, the number of kilometers per year that each type of road network requires to reach its respective target by 2030 was determined. This allows for projecting the total annual length of the road network, enabling the application of the unit maintenance costs reported by the World Bank's ROCKS database for each year. It was assumed that routine maintenance is performed annually, while periodic maintenance is performed halfway through the asset's useful life.

The annual investment required to cover asset replacement corresponds to annuities that replace the net value of existing assets, assuming a useful life of 30 years.

Because these values are model parameters, the estimates can be subjected to sensitivity analysis when the assumptions change.

E.2. Calculation of the Infrastructure Gap for Providing Adequate Logistics

To calculate the infrastructure gap for providing adequate logistics, airport investment gaps were considered; to this end, relevant studies providing specific information on these investment requirements were identified.

E.2.1. Definition of the target in accordance with the relevant SDG

The relevant SDG is Goal 9, which addresses the need to "build resilient infrastructure, promote inclusive and sustainable industrialization, and foster innovation." In particular, Target 9.1 is aimed at "developing reliable, sustainable, resilient, and quality infrastructure, including regional and cross-border infrastructure, to support economic development and human well-being, with a special emphasis on affordable and equitable access for all." For this reason, although there is no explicit target for 2030, guided by the core indicator used in this SDG, we will focus on airport investments that ensure connectivity among LAC countries.

E.2.2. Relevant Studies on the Logistics Gap

Regarding the airport gap, the information presented in this report is based on Brichetti *et al.* (2023). That study estimated the investments needed to ensure access to airport infrastructure for populations living in urban centers with more than 100,000 inhabitants in the region. It should be noted that these estimates capture only a portion of the investment needs related to logistics infrastructure, as they do not incorporate other relevant dimensions, such as the port infrastructure gap—which is not quantified in this document—or other complementary logistics components. In this regard, the total investment gap in logistics infrastructure in the region is substantially wider than that reflected by the airport estimates included in this study.

E.3. Calculation of the Infrastructure Gap for Providing Adequate Urban Mobility

To calculate the infrastructure gap for providing adequate urban mobility, it was necessary to define the target to be achieved in accordance with the relevant SDG, collect information on the infrastructure available for urban mobility, determine the relevant unit costs, and establish the calculation procedure.

E.3.1. Definition of the target in accordance with the relevant SDG

The relevant SDG is Goal 11, and specifically Target 11.2, which states: "By 2030, provide access to safe, affordable, accessible, and sustainable transport systems for all and improve road safety, in particular by expanding public transport, paying special attention to the needs of people in vulnerable situations, women, children, people with disabilities, and older persons." Since no specific target is provided, this study will calculate the urban mobility infrastructure gap for cities with more than 500,000 inhabitants, comparing them to the standard set by the best-performing cities in Latin America and the Caribbean (LAC).

E.3.2. Sources of Information on Current Mass Transit Routes

Data on current mass transit routes in LAC—Bus Rapid Transit (BRT), commuter rail systems, and subway systems—have been obtained using a variety of information sources.

For BRT and high-capacity motorized transit systems, the primary source of information has been BRTData. The development of the platform and the collection of data are the result of a partnership between the members of BRT + CoE and the Institute for Transportation and Development Policy (ITDP). Currently, BRTData is managed and updated by WRI Brasil Ross Center for Sustainable Cities. Early versions of the database were supported by the International Energy Agency (IEA) and the Latin American Association of Integrated Transportation Systems and BRT (SIBRT), now known as SIMUS.

For commuter rail and subway systems, information was gathered from individual sources for each city included in the study, using both government and private data sources.

The cities in the region whose mass transit systems have data that have been incorporated into this study are presented in Table A.2.

Table A.2. *Cities in Latin America and the Caribbean considered individually for the calculation of urban mobility infrastructure gaps.*

Country	City	Country	City
Argentina	Buenos Aires	Costa Rica	San José Metropolitan Area
Argentina	Córdoba	Dominican Republic	Santo Domingo
Brazil	Belém	Ecuador	Guayaquil
Brazil	Belo Horizonte	Ecuador	Quito
Brazil	Brasília	El Salvador	San Salvador Metropolitan Area
Brazil	Campinas	Guatemala	Guatemala City
Brazil	Curitiba	Mexico	Acapulco
Brazil	Fortaleza	Mexico	Chihuahua
Brazil	Goiânia	Mexico	Guadalajara
Brazil	Guarulhos	Mexico	Guadalupe
Brazil	Londrina	Mexico	Ciudad Juárez
Brazil	Maceió	Mexico	León

Brazil	Natal	Mexico	Mexico City Metropolitan Area
Brazil	Porto Alegre	Mexico	Monterrey
Brazil	Recife	Mexico	Puebla
Brazil	Rio de Janeiro	Panama	Panama City
Brazil	Salvador	Peru	Lima
Brazil	São Paulo	Puerto Rico	San Juan Metropolitan Area
Brazil	Teresina	Uruguay	Montevideo
Brazil	Uberlândia	Venezuela	Barquisimeto
Chile	Santiago	Venezuela	Caracas
Colombia	Barranquilla	Venezuela	Maracaibo
Colombia	Bogotá	Venezuela	Valencia
Colombia	Bucaramanga		
Colombia	Cali		
Colombia	Cartagena		
Colombia	Medellín		
Colombia	Pereira		

Source: Prepared by the authors.

E.3.3. Unit Costs

To quantify the urban mobility infrastructure gap, unit costs associated with the construction of new dedicated lanes for BRT systems, commuter rail lines, and subway lines were used. These costs were estimated based on the unit values defined in the original infrastructure gap study (Brichetti et al., 2021), which were derived from a survey of urban transportation projects implemented in Latin America and the Caribbean, as well as in other developed and developing countries, over the past decade.

For BRT systems, information on projects to expand and construct dedicated lanes—compiled by the IDB's Transportation Division—was considered, including experiences in countries across the region and comparable international cases. In the case of commuter rail lines, unit costs were based on international technical references regarding mass transit options, while for subway systems, data were collected on metro system expansion projects in various cities around the world, capturing a wide range of urban and technological contexts. For a detailed description of the sources and the original estimation procedure for these unit costs, see Brichetti et al. (2021).

Building on this foundation, the originally defined unit costs were updated through an inflation adjustment for the period between 2018 and 2024, using the U.S. Consumer Price Index, with the aim of expressing them in monetary values consistent with the base year of this study. As a result of this procedure, the unit investment costs used to quantify the urban mobility gap—expressed in millions of U.S. dollars per kilometer—amount to USD 14.8 for the construction of dedicated BRT lanes, USD 45.6 for the construction of commuter rail lines, and USD 137.7 for the construction of subway lines.

E.3.4. Procedure for Calculating the Urban Mobility Infrastructure Gap

To calculate the urban mobility infrastructure gap, multiple calculations and assumptions were made, which are described below.

First, all cities in the region with populations exceeding 500,000 were identified for which reliable information was available regarding the size of their mass transit networks (including both BRT and rail systems). Next, the cities were grouped into two subgroups based on population size: cities with populations between 500,000 and 5 million (Tier 1) and cities with populations exceeding 5 million (Tier 2).

Next, the number of kilometers of mass transit networks per million inhabitants was determined for the identified cities.

Based on these indicators, two *benchmarks* were subsequently defined for each subgroup of cities (Tier 1 and Tier 2). For cities with populations between 500,000 and 5 million (Tier 1), the benchmark used was the average number of kilometers of public transit per million inhabitants in Córdoba (Argentina) and Natal, Porto Alegre, and Recife (Brazil), which totals 59.9; while for cities with more than 5 million inhabitants (Tier 2), Buenos Aires, Rio de Janeiro, and Santiago were used as *benchmarks*, with an indicator of 55.4.

Once these benchmark values were estimated, the number of kilometers of mass transit infrastructure that needed to be built for cities in the region to achieve similar levels of coverage was estimated. To do this, data from the United Nations on current population and projections through 2030 were used.

Additionally, the study estimated the region’s population living in cities with more than 500,000 inhabitants—which was not included in the sample of cities with mass transit systems. For this purpose, it was assumed that these cities currently lack access to mass transit systems. In this case, the comparison with the *benchmarks* was made by assuming that the coverage levels achievable during the period were one-fifth of those of the cities included in the sample. This is a conservative assumption, as it considers cities outside the sample that do not have sufficient population density to sustain efficient mass transit systems. Nevertheless, this assumption is a parameter of the estimate and is therefore subject to modification.

Once the number of kilometers of mass transit networks required to close the gaps relative to the predetermined *benchmarks* was determined, two scenarios were considered to quantify the investments:

- The first prioritizes the cost-effectiveness of mass transit investments, based primarily on BRT solutions. It assumes that the gap in kilometers of mass transit to be built would be closed by constructing 75% of the required kilometers with BRT lanes, 15% with commuter rail lines, and 10% with subway lines. The associated investment cost was calculated by multiplying the required kilometers of each type of solution by the unit costs described above. This is the scenario reported throughout this report (225 billion USD).
- The second prioritizes the capacity and quality of mass transit investments and relies mainly on rail-based solutions. It assumes that the gap in required mass transit kilometers would be closed by constructing 30% of the additional network as BRT lanes, 20% as commuter rail lines, and 50% as subway lines. The associated investment cost was calculated by multiplying the required kilometers of each type of solution by the unit costs described above. This resulted in a substantially higher investment requirement, totaling 586 billion dollars.

F. CONSOLIDATED RESULTS AND AVAILABILITY OF INFORMATION BY COUNTRY

As mentioned in this study, the estimates were made based on the information available regarding the status of services in each country. The following tables summarize the availability of information for calculating the various infrastructure gaps in each country in the region and present the disaggregated results.

Table A.3. *Availability of Information for Calculating the Gap by Sector and Country*

Country	Water and Sanitation			Electricity		Transport			Telecommunications			
	Water Access	Sanitation Access	Wastewater Treatment	Access	Generation and Transmission	Roads	Airports	Urban Mass Transport	Fixed Broadband	4G	5G	Total Investment
Argentina	🟢	🟢	🟢	🟢	🟢	🟢	🟢	🟢	🟢	🟢	🟢	🟢
The Bahamas	🟢	🟢	🔴	🔴	🔴	🔴	🔴	🔴	🟢	🟢	🟢	🟢
Barbados	🟢	🟢	🔴	🟢	🔴	🔴	🔴	🔴	🟢	🟢	🔴	🟢
Belize	🟢	🟢	🔴	🟢	🟢	🟢	🔴	🔴	🟢	🟢	🔴	🟢
Bolivia	🟢	🟢	🟢	🟢	🟢	🟢	🔴	🟢	🟢	🟢	🔴	🟢
Brazil	🟢	🟢	🟢	🟢	🟢	🟢	🟢	🟢	🟢	🟢	🟢	🟢
Chile	🟢	🟢	🟢	🟢	🟢	🟢	🟢	🟢	🟢	🟢	🟢	🟢
Colombia	🟢	🟢	🟢	🟢	🟢	🟢	🟢	🟢	🟢	🟢	🟢	🟢
Costa Rica	🟢	🟢	🟢	🟢	🟢	🟢	🔴	🟢	🟢	🟢	🟢	🟢
Ecuador	🟢	🟢	🟢	🟢	🟢	🟢	🟢	🟢	🟢	🟢	🟢	🟢
El Salvador	🟢	🟢	🟢	🟢	🟢	🔴	🟢	🟢	🟢	🟢	🔴	🟢
Guatemala	🟢	🟢	🔴	🟢	🟢	🟢	🟢	🟢	🟢	🟢	🟢	🟢
Guyana	🟢	🟢	🟢	🟢	🟢	🔴	🔴	🔴	🟢	🟢	🔴	🟢
Haiti	🟢	🟢	🔴	🟢	🟢	🔴	🟢	🟢	🟢	🟢	🔴	🟢
Honduras	🟢	🟢	🔴	🟢	🟢	🟢	🟢	🟢	🟢	🟢	🟢	🟢
Jamaica	🟢	🟢	🔴	🟢	🟢	🟢	🔴	🟢	🟢	🟢	🟢	🟢
Mexico	🟢	🟢	🟢	🟢	🟢	🟢	🟢	🟢	🟢	🟢	🟢	🟢
Nicaragua	🟢	🟢	🟢	🟢	🟢	🟢	🟢	🟢	🟢	🟢	🟢	🟢
Panama	🟢	🟢	🔴	🟢	🟢	🟢	🟢	🟢	🟢	🟢	🟢	🟢
Paraguay	🟢	🟢	🟢	🟢	🟢	🟢	🟢	🟢	🟢	🟢	🟢	🟢
Peru	🟢	🟢	🟢	🟢	🟢	🟢	🟢	🟢	🟢	🟢	🟢	🟢
Dominican Republic	🟢	🟢	🟢	🟢	🟢	🟢	🟢	🟢	🟢	🟢	🟢	🟢
Suriname	🟢	🟢	🟢	🟢	🔴	🟢	🔴	🔴	🟢	🟢	🟢	🟢
Trinidad and Tobago	🟢	🟢	🟢	🟢	🟢	🔴	🔴	🟢	🟢	🟢	🔴	🟢
Uruguay	🟢	🟢	🔴	🟢	🟢	🟢	🔴	🟢	🟢	🟢	🟢	🟢
Venezuela	🟢	🟢	🔴	🟢	🔴	🔴	🟢	🟢	🟢	🟢	🟢	🟢

🟢 *With available information for the infrastructure gap estimation* 🔴 *Without available information for the infrastructure gap estimation*

Source: Author's own calculations.

Table A.4. *Consolidated results of the total infrastructure gap (new investment + maintenance and asset replacement) by sector and country (millions of USD).*

Country	Water and Sanitation			Energy		Telecommunications	Transport				Total
	Safe Access (High) - Water	Safe Access (High) - Sanitation	Wastewater treatment	Electricity access	Generation and Transmission (Baseline scenario)	Access to Broadband + 4G	Roads	Airports - High Access	Urban Mass Transportation - BRT Scenario	Not Included Electromobility	
Argentina	$7,268	$14,922	$2,153	$3,817	$51,702	$9,746	$45,834	$437	$4,844	$-	$140,723
Bahamas	$126	$183	$-	$-	$-	$89	$-	$-	$-	$-	$399
Barbados	$122	$144	$-	$22	$-	$53	$-	$-	$-	$-	$341
Belize	$185	$250	$-	$49	$764	$188	$395	$-	$-	$-	$1,831
Bolivia	$4,789	$8,574	$167	$1,804	$3,329	$5,068	$17,404	$-	$1,146	$-	$42,281
Brazil	$28,859	$72,664	$6,670	$19,005	$107,297	$52,112	$247,709	$3,560	$35,468	$-	$573,346
Chile	$2,360	$4,092	$40	$1,734	$33,630	$4,539	$14,601	$262	$599	$-	$61,858
Colombia	$10,660	$21,754	$2,499	$7,929	$23,801	$14,242	$48,039	$275	$11,284	$-	$140,483
Costa Rica	$805	$1,875	$216	$489	$3,309	$1,111	$7,263	$-	$140	$-	$15,206
Ecuador	$4,240	$7,132	$461	$1,706	$11,841	$4,714	$16,793	$87	$2,077	$-	$49,052
El Salvador	$1,775	$2,763	$284	$591	$3,908	$1,611	$-	$450	$917	$-	$12,297
Guatemala	$5,999	$14,426	$-	$2,181	$4,364	$5,578	$4,576	$750	$2,864	$-	$40,739
Guyana	$188	$317	$1	$101	$302	$422	$-	$-	$-	$-	$1,331
Haiti	$5,597	$12,036	$-	$3,202	$124	$5,615	$-	$262	$652	$-	$27,487
Honduras	$2,934	$5,064	$-	$1,867	$2,196	$3,784	$2,688	$275	$552	$-	$19,360
Jamaica	$1,139	$837	$-	$270	$1,307	$527	$5,182	$-	$139	$-	$9,401
Mexico	$30,686	$46,944	$2,006	$11,294	$46,672	$31,033	$69,241	$87	$17,373	$-	$255,336
Nicaragua	$2,161	$4,642	$172	$419	$1,432	$2,777	$3,194	$3,248	$250	$-	$18,295
Panama	$1,816	$2,210	$-	$558	$2,577	$1,403	$4,284	$375	$2,185	$-	$15,408
Paraguay	$1,565	$2,433	$196	$573	$1,877	$2,361	$5,299	$87	$784	$-	$15,175
Peru	$8,458	$16,338	$739	$3,605	$8,673	$11,545	$23,211	$175	$4,583	$-	$77,328
Dominican Republic	$2,719	$4,809	$430	$1,246	$3,977	$2,655	$4,009	$550	$3,153	$-	$23,547
Suriname	$148	$278	$20	$52	$116	$241	$555	$-	$-	$-	$1,410
Trinidad and Tobago	$246	$482	$15	$84	$1,040	$271	$-	$-	$128	$-	$2,266
Uruguay	$421	$1,316	$-	$268	$3,376	$647	$1,792	$-	$1,613	$-	$9,433
Venezuela	$8,983	$9,880	$-	$1,974	$-	$11,174	$-	$1,611	$8,011	$-	$41,633
LAC	**$134,247**	**$256,366**	**$16,067**	**$64,840**	**$317,613**	**$173,508**	**$522,070**	**$12,492**	**$98,762**	**$-**	**$1,595,965**

Source: Author's own calculations.

IDB

Improving lives