

**NEW HORIZONS FOR
PRODUCTIVE TRANSFORMATION**
IN THE ANDEAN REGION

Financing

**the Productive Transition
in the Andean Region**



Financing the Productive Transition in the Andean Region

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INTRODUCTION

FINANCING THE PRODUCTIVE TRANSITION IN THE ANDEAN REGION

Global agreements towards a world with net-zero emissions are a reality, evidenced by the commitments made by a vast majority of countries through various documents aiming for the same goal: a global productive transition beyond the energy transition. Numerous studies (Inter-American Development Bank, International Monetary Fund, World Bank, International Energy Agency, ECLAC, etc.) have analyzed this process, generally and explicitly identifying challenges and opportunities, including detailed regional and country-specific studies.

In general, the productive transition is advancing. On the one hand, automation and digitalization are transforming the way we produce and do business, driven not only by the emergence of new technologies but also by a transformation in the productive structures that quickly adapt to innovations in existing technologies (Bosch et al., 2018). Although the digitalization of productive processes poses employment risks, it also creates new job opportunities. However, this would not have been possible without the necessary investment to enable this transition effectively and promptly. On the other hand, although the world is not investing enough to meet its future energy needs, the average global cost of energy from renewable sources is rapidly decreasing (IEA, 2021; IEA, 2020; IRENA, 2020).

The transition also presents several challenges, ranging from financial and technological aspects to regulatory and social barriers. Indeed, achieving climate goals will involve overcoming the challenge of achieving substantial improvements in energy efficiency, revising global value chains (GVCs), diversifying the productive structure, and expanding options that not only mitigate the direct losses from the energy transition but also generate net benefit through operational savings in energy and income from ecosystem services (Manzano et al., 2023). Therefore, the productive transition requires a convergence of multidimensional efforts covering government policies, private investments, technological innovation, and international collaboration.

Furthermore, the benefits of a productive transformation are extensive and go beyond mitigating climate change. Economically, diversifying economies will promote job creation, reduce vulnerability to external shocks, and stimulate sustainable long-term economic growth. In turn, new technologies will enable improvements in efficiency and productivity. Regarding environmental sustainability, adopting clean technologies will reduce the industrial activity's environmental impact, generating benefits for public health and protecting biodiversity.

In the Andean Region, productive challenges are significant. The region is characterized by low tax revenue and depends on income derived from exploiting raw materials and the main export items. Thus, it is crucial to invest in innovation and the adoption of new technologies and have a vision for GVCs, which can play a fundamental role in promoting competitiveness and productive diversification (Andrian et al., 2020). Agriculture faces significant challenges regarding productivity, rural infrastructure, and strengthening institutional mechanisms at the sectoral level. Meanwhile, the services sector also shows low productivity and high informality, while the extractive industries sector requires innovation to remain competitive (Manzano et al., 2023). Additionally, business digitization is significantly lagging in the region

(Lopez et al., 2023). Furthermore, the transition will have social impacts, and although growth in the region improves social conditions, inequality remains an ongoing issue (de la Cruz et al., 2020).

Additionally, an accelerated decarbonization process towards zero emissions by 2050 may cause significant losses in the growth potential of the Andean countries, whose impact will depend on their economic structures. If the region fails to diversify, the opportunity cost facing global and local decarbonization may be considerable. However, implementing a 20% tax on the use of fossil fuels to encourage domestic decarbonization, along with reinvesting these revenues in public infrastructure, could mitigate the contractive effect and even stimulate productive transformation (Andrián & Álvarez, 2023).

Opportunities also arise for the region in the face of a transformation process, and its success is possible. However, successful transitions that generate employment and improve social conditions have been characterized by requiring coordination processes between the public and private sectors to identify critical interventions (Gualdron & Manzano, 2022). Indeed, the region needs structural reforms to boost private investment growth and productivity, close infrastructure gaps in the agricultural sector, integrate into GVCs, diversify by boosting service exports, improve the competitiveness of the tourism sector, develop a human capital strategy for the extractive sector, promote business digitization, and foster inclusion (Manzano et al., 2023; de la Cruz et al., 2020).

In this regard, leveraging opportunities and overcoming challenges requires increasing public and private financing and creating environments encouraging investment, such as stable policies, tax incentives, and innovative financing mechanisms that can reduce investors' risks. Despite advances in some aspects of climate financing, from creating institutional bases and regulatory frameworks to issuing green bonds in countries like Peru and Colombia, there is still much to do.

Overcoming these financial gaps will require coordinated efforts among governments, international financial institutions, the private sector, and civil society to develop innovative financing mechanisms and guarantees that reduce risk and mobilize necessary resources to the region. Agreements and collaboration among Andean countries can facilitate regional integration. International cooperation, particularly regarding access to advanced technologies and climate financing, is crucial for accelerating the transition. Implementing green financing, carbon bonds, and sustainability investment funds can provide the necessary resources to move toward a sustainable Andean Region.

In this context, and following interactions with institutions and governments where the *"New Horizons of Productive Transformation in the Andean Region"* have been discussed, the importance of addressing financing gaps to overcome obstacles to an effective regional transition is evident. This document delves into the complex dynamics of financing this transition, exploring the multifaceted roles of public and private investments, the impact of stranded assets and technological changes, and the need for financial systems and innovative mechanisms. Through an integrated analysis across four chapters, we offer a comprehensive overview of strategies and policies that could enable Andean countries to navigate their transitions effectively and sustainably.¹

Specifically, chapter one addresses the complex relationship between financing mechanisms and economic outcomes in the Andean Region, aiming to analyze how fiscal policies, including financing through external and internal debt, carbon taxes, and direct taxes, can be used to mitigate the adverse impacts of decarbonization while simultaneously leveraging opportunities for growth and diversification through investment. Some challenges and opportunities facing the region are analyzed using scenarios and simulations, thus contributing to the debate on informed public policy. At the same time, the impact

¹ Each chapter corresponds to a paper commissioned by the IDB from the authors, so the chapters present structure, format, results, and analysis defined by the authors and not by the editors.

of the global decline in oil demand, its price, the effects of technological change, and the impact of the cost of financing the transition on the region's economies are estimated.

It is concluded that while the transition promises to improve economic productivity, it also entails costs and challenges that must be addressed through specific policy interventions. The shift to cleaner energy sources requires substantial investments in renewable infrastructure, technological innovation, and human capital development. These initial costs challenge governments, especially in the context of limited fiscal budgets and competing development priorities. Additionally, the energy transition is likely to happen in a context of stranded assets, where investments in fossil fuel infrastructure become economically unviable due to regulatory, technological, and market changes. Given these complexities, developing an effective fiscal framework to finance the energy transition requires consideration of each country's specific circumstances and challenges, exploring a diverse range of fiscal instruments, and improving public spending efficiency to mobilize resources toward the transition.

The second chapter thoroughly explores the challenges and opportunities for both public and private investment at the national and sub-national levels, particularly emphasizing private investment's role as a transformation driver. Reviewing various regional and subnational experiences presents a comprehensive view of the current state, potential opportunity areas, and economic, social, or public policy-related limitations affecting the stakeholders involved in this transition process. This analysis aims to identify ways to maximize the impact of investments and outline a common path to overcome obstacles to productive transformation, considering each region's context and specific advancements.

The study reflects that the effectiveness of public policies and progress toward productive projects aimed at transformation have been limited by several critical factors, among which are the underutilization of alternative energies at the local level and a notable lack of recognition of the importance of public investments and attracting private capital to sustainable development initiatives stand out. The limited perception of companies and international financial funds and the insufficiency of subnational initiatives to catalyze significant investments or generate broader interest in sustainability underscore the need for a coordinated strategy. This strategy should establish clear and effective public policies, promote close collaboration between civil society, financial entities, and governments, and develop a solid regulatory framework that facilitates investment and raises awareness of productive transformation's environmental and economic benefits.

The third chapter explores the mobilization of official funds, including international support and regional cooperation. Various financing mechanisms and necessary reforms are discussed to attract and mobilize climate finance. The potential of multilateral and the strategic use of official funds to catalyze private sector commitment and investment in the productive transition are evaluated, outlining the opportunities and challenges inherent in effectively accessing and deploying these funds.

The main conclusions and recommendations of the chapter emphasize the need for reforms in governance and regulatory frameworks of critical sectors, such as energy, transport, and agriculture, to enable greater private sector participation in the transition. It highlights how official financing, including that from multilateral partners, could catalyze the necessary private sector investment for the transition. The regional integration of energy markets and the promotion of green investment are key strategies to overcome governance challenges and attract global investor interest. Finally, the importance of transparency in aligning investments with new investor preferences for sustainable options is underscored, thus promoting inclusive and sustainable development in the region.

In the fourth and final chapter, a comprehensive analysis is conducted on the readiness of the financial systems in the Andean Region to handle climate financing. It employs two primary methodologies

to measure the capabilities and operations of climate finance mechanisms in these countries: policy analysis and institutional arrangements and a detailed study of the organization of the financial industry, including the availability of green financial products. Using a set of indicators evaluated in four main categories—financial planning, access to financing, execution of financing, and monitoring, reporting, and verification (MRV)—the study highlights the heterogeneity in progress among these countries. It underlines the challenges in executing financeable projects, private sector involvement, and the need to improve MRV systems.

The main findings indicate that although there are advancements in some aspects of climate financing, such as green bonds in Peru and Colombia, significant gaps remain to overcome. It emphasizes the progress and heterogeneity in creating policy frameworks and developing green financial products in the countries, albeit acknowledging variability in the progress made, reflecting differences in national priorities, capabilities, and economic contexts. Additionally, it underscores the need for greater integration of the private sector into climate financing strategies and cooperation to share best practices and advancements among the countries in the region. The document recommends improving policy implementation, enhancing MRV capacity, and developing competitive and attractive financial products for investors and recipients.

The chapters presented in the document outline both the convergences and divergences on the path to a productive transition in the Andean Region. All chapters consistently emphasize the need for climate financing as a central axis to achieve decarbonization goals, highlighting solid regulatory frameworks and national and international collaboration's crucial role in mobilizing the necessary resources. Technological innovation and citizen participation also emerge as common themes, highlighting the importance of social acceptance and technological adaptation. However, they differ in their specific focus. While the initial chapters concentrate on assessing macro policies and the organization of the financial industry, the last chapter delves into the effective readiness of financial systems to manage climate financing, revealing a disparity in the supply of green financial products and the conditions for their competitiveness and appeal.

Closing the introduction and marking the step toward the first chapter, it is essential to recognize that the productive transition in the Andean Region is not just a technical or financial challenge but a unique opportunity to reshape economies towards more sustainable and resilient models. Despite the barriers identified, the joint analysis of these chapters provides a clear roadmap that underscores the need for concerted action among governments, the private sector, and civil society. Moving forward, it becomes clear that collaboration, innovation, and financial commitment are fundamental pillars for overcoming obstacles towards sustainability. With this common understanding, the document moves toward a detailed exploration of the mechanisms and strategies required to catalyze the productive transition in the Andean Region, starting with an in-depth look at the policy frameworks and institutional arrangements that set the stage for climate financing in the first chapter.

The Effects of the Productive Transition on Andean Economies

1. THE EFFECTS OF THE PRODUCTIVE TRANSITION ON ANDEAN ECONOMIES: STRANDED ASSETS, TECHNOLOGICAL CHANGE, AND FINANCING COSTS

LEANDRO ANDRIAN, MARTÍN CICOWIEZ, AND CARLOS MIGUEL ÁLVAREZ

1. Introduction

The energy transition will entail the simultaneous decarbonization on the global and domestic levels. The analysis of global decarbonization considers the dynamics of a variety of variables at an aggregate level, including public and private investment, new technologies that enhance energy efficiency, changes in global energy and goods demand and supply, and hydrocarbon and other energy prices, as well as the carbon market. The analysis of domestic decarbonization, by comparison, focuses on expected changes on the domestic demand of energy, technological steps and regulatory actions that will enable countries to move toward a net-zero-emission future.

Furthermore, the characteristics, structure, and size of economies play a significant role in these dynamics. Depending on the size of a country's economy, domestic decarbonization may impact global dynamics, because larger (smaller) economies tend to have a greater (lesser) impact on global markets. Additionally, hydrocarbon-exporting countries may be affected differently than net hydrocarbon-importing countries. Because the former heavily rely on hydrocarbons for revenue, the expected effect of global decarbonization is more significant for them and their domestic transitions become more challenging.

In the case of the Andean countries, none exhibit characteristics or sizes that suggest they will have a significant impact on global decarbonization. For these countries, it is the domestic transition that poses significant challenges. Hydrocarbon-exporting countries such as Bolivia, Colombia, Ecuador, and Venezuela are expected to face a more complex and costly process, whereas Peru, a net hydrocarbon importer, may be able negotiate the changes more easily and such changes could even have a positive effect on economic activity.

Andrian and Álvarez (2023) examine the effect of global decarbonization on the Andean countries. These authors employed a dynamic computable general equilibrium model to scrutinize how global decarbonization, manifested through various trajectories in oil prices, could influence the economies of these countries. The findings revealed potentially significant welfare losses across Andean nations, with projections of substantial declines in household consumption and private investment under scenarios of reduced oil prices.

Moreover, this study underscores the vulnerability of Andean economies to shifts in global oil prices, emphasizing the need for strategic planning and policy interventions to navigate the transition toward cleaner energy sources. In particular, Andrian and Álvarez (2023) highlight the adverse effects on government revenues, employment, and investment stemming from reduced demand for hydrocarbons.

However, amid these challenges lie opportunities. The diversification of these economies away from hydrocarbon dependence presents prospects for bolstering resilience and fostering sustainable growth. By redirecting fiscal resources toward infrastructure investment and leveraging emerging industries, such as tourism, services and agriculture, Andean nations can chart a path toward economic diversification and sustainability (Andrian & Manzano, 2023).

Amid the global shift toward the energy transition, it is imperative to understand the impact of the domestic transition specifically in terms of costs, because the financing dynamics of the transition will impact economies, particularly those heavily reliant on hydrocarbon industries. Thus, the paramount questions arise: How will the domestic energy transition be financed? Secondly, what will be the impact of the financing costs associated with the energy transition on the Andean economies? Addressing this issue is critical for elucidating the broader ramifications of transitioning away from fossil fuels and devising effective policy responses.

Building upon these insights, this chapter undertakes a deep investigation of the nexus between financing mechanisms for the energy transition and economic outcomes in the Andean region. It seeks to elucidate how fiscal policies, such as external and domestic debt financing, carbon taxes, and direct taxes, can be leveraged to mitigate the adverse impacts of decarbonization while capitalizing on opportunities for growth and diversification through investment.

Attempting to predict the evolution of an economy in the face of the challenges described above is a complex task. However, the use of scenarios and simulations makes it possible to analyze some of the challenges and opportunities facing the region, while adding value to the debate on informed public policy.

In this chapter we use a similar dynamic recursive computable general equilibrium (CGE) model to address the following questions of interest: How does one aspect of the global decarbonization process—such as the potential decline in oil demand and therefore in the price of oil—affect the Andean region? What are the effects on the region's economies of the change in the energy matrix? What is the impact of the financing cost of the energy transition on these economies? In essence, decarbonization for the Andean economies will be examined in light of three aspects: a global decarbonization scenario, the transition toward renewable sources of energy, and the financing cost.

The chapter is organized as follows: first, brief descriptions of the model and of the Andean economies are presented. Next, the global decarbonization scenario is described. Then, the Andean economies are analyzed under the different scenarios. Subsequently, the issue of domestic decarbonization is addressed through the effect on the Andean economies of substituting technologies that use fossil fuels with cleaner technologies. Finally, the impact of how the energy transition could be financed is analyzed.

2. Description of the model and the Andean economies¹

CGEs are mathematical tools that allow us to understand and analyze an entire economy by considering the interactions between production, product demand, intermediate inputs, prices, costs, and other elements that ensure economic equilibrium.²

These models require that the data be organized by means of a social accounting matrix (SAM) and in the present analysis a SAM is needed for each of the Andean countries. A SAM describes the circular flow of transactions between different economic agents during a reference year. This calibration ensures that the model reflects the structure of each economy that we are modeling. Thus, the model makes possible the analysis of the impact of shocks within a framework of accounting consistency, where the budget constraints of the different agents and the economy as a whole are enforced (i.e., incomes and expenditures must be balanced), something that is not possible in alternative approaches. For the Andean economies, the base years for the SAMs built are 2014 for Bolivia, 2017 for Colombia, 2019 for Ecuador, and 2017 for Peru.

The description of the socioeconomic structures of the Andean countries (using the SAMs) is useful for interpreting the results obtained through the developed simulations. For instance, knowledge of the factor intensity of each productive sector (e.g., labor/capital ratio) contributes to the explanation of the pattern of winners and losers resulting, *ceteris paribus*, from an increase in factor use tax. Additionally, sectors more (less) oriented toward international trade will be directly harmed (benefited) by an appreciation of the real exchange rate that could occur, for example due to an increase in external borrowing by a government to finance the energy transition.

Panels a–d of Figure 1 show a summary of the sectoral structures of the economies of the Andean countries in terms of value added, employment, exports, and imports. In all countries, and especially in Colombia, the production of services represents the largest proportion of GDP in terms of value added. On the other hand, except for in Peru economic activities associated with hydrocarbons represent a significant portion of GDP. This is especially in Bolivia. In Peru, mining represents a significant proportion of value added. Agriculture in the Andean region stands out, accounting for between 10 percent (Colombia) and 16 percent (Bolivia) of the value added.

¹ This section is based on Andrian and Álvarez (2023).

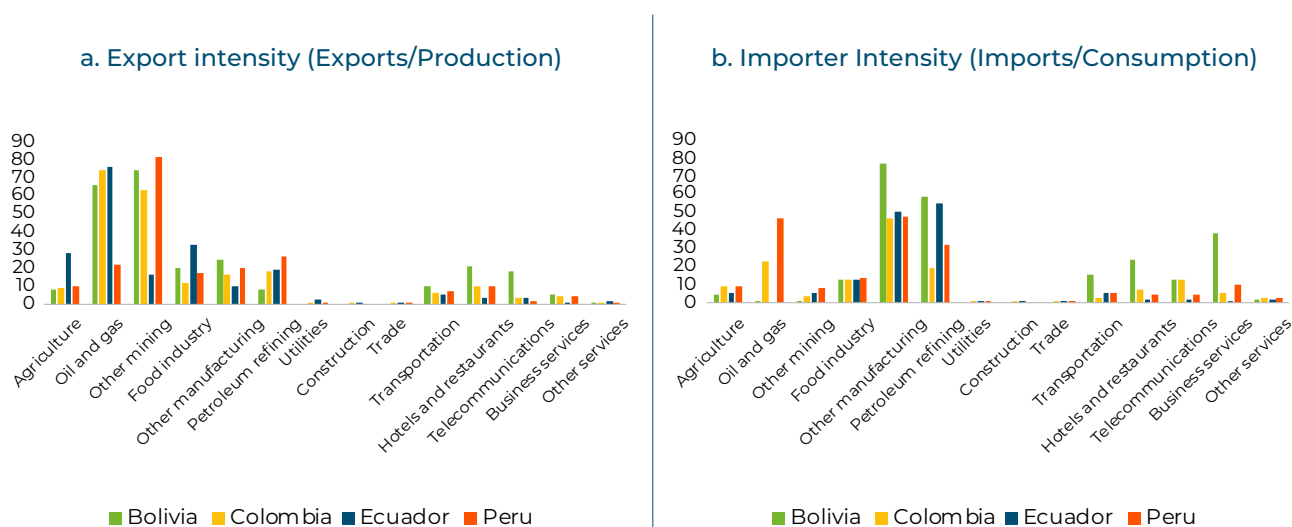
² The model we use follows those of Andrian and Álvarez (2023) and Banerjee et al. (2016).

Figure 1. Sectoral Structures of the Andean Economies in the Base Year

Source: Andrian and Álvarez (2023).

Regarding employment, the agricultural sector has shares ranging from 17 percent (Colombia) to 35 percent (Bolivia) of total employment. It is an economic activity with a relatively low ratio between value added and employment. In terms of proportions of total employment, the same is true of the trade sector, with shares ranging from 17 percent in Bolivia to 24 percent in Ecuador. The mining sectors and hydrocarbon activities, on the other hand, account for very small proportions of total employment across the four countries.

In exports, there is a high dependency on the hydrocarbon sector in Bolivia, Ecuador, and Colombia, while in Peru, the dependency lies with the mining sector. The importance of the mining sector in Bolivia and Colombia is also notable. Furthermore, in panel a of Figure 2, it can be observed how these sectors are also export oriented, reflecting export intensity levels above 60 percent for most of the Andean countries. In the case of Bolivia, the agro-food sector represents a significant proportion of total exports, with export intensity levels exceeding 25 percent.

Figure 2. Export and Import Orientation of the Andean Economies in the Base Year

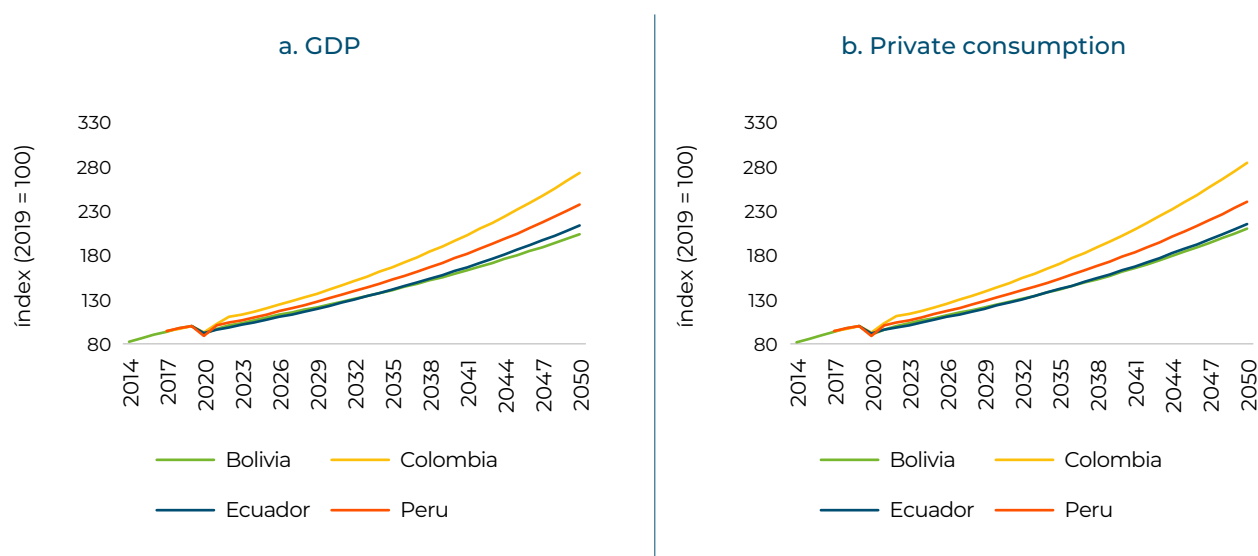
Source: Andrian and Álvarez (2023).

Regarding imports, manufactured industrial goods make up the bulk of most imports into the four countries. These primarily consist of capital goods such as machinery and equipment and vehicles. In Peru, 80 percent of the machinery and equipment used is of imported origin. It is worth noting that, in all countries, but especially in Ecuador (18 percent), imports of refined petroleum products represent a relatively large portion of the total. For Peru, if oil and gas are included, imports from the hydrocarbons sector exceed 15 percent.

3. The scenarios

A. Baseline

The “business-as-usual” scenario projects the evolution of the Andean economies until 2050 (Figure 3). In this scenario, the evolution of the economies is constructed under the assumption that existing policies in the base year are not modified. Furthermore, it is assumed that global oil prices replicate the trajectories observed through 2021 and remain constant during the period 2022–2050. In other words, the base scenario assumes that the world price of a barrel of oil remains constant, in real terms, at USD 70 per barrel from 2022 to 2050. The international price of refined petroleum products follows the same trend as the crude oil price. GDP growth rates are also assumed to be exogenous. They replicate the IMF’s World Economic Outlook projections for the years 2024 to 2028. Growth rates for the period 2029–2050 are assumed to be equal to those projected for 2028. By construction, the base scenario assumes that the economies of the Andean countries evolve in a balanced manner in the sense that macroeconomic aggregates all grow at similar rates. In this way, the base scenario serves as the basis for constructing a framework of comparison within which the Andean economies evolve under relatively stable conditions.

Figure 3. GDP and Private Consumption in the Base Scenario (2019=100)

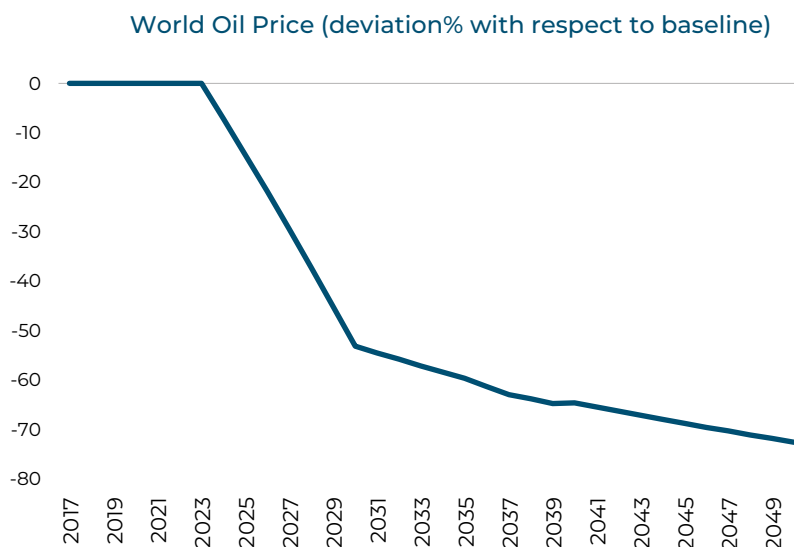
Source: Andrian and Álvarez (2023).

B. The net-zero scenarios

The analysis makes use of simulations of alternative scenarios in order to compare, in each country of the Andean region, the evolution of the economy in response to the shocks introduced with the evolution of the economy in the business-as-usual scenario. The following alternative scenarios are developed:

- a)** The global decarbonization scenario is captured through a decrease in the international price of oil (Figure 4), its derivatives, and coal: the price trajectory is taken from the World Energy Outlook 2021 by the International Energy Agency (IEA). The trajectory is updated by modifying the values for the early years based on historical data and smoother transitions were used to converge to the values for 2050 presented by the IEA (2021), because it only provides values for 2020, 2030, and 2050. Thus, the reference price for oil per barrel in 2050 is USD 24 and it is based on the “Net Zero Emissions by 2050” (NZE) scenario from the IEA (2021), which establishes a narrow but achievable path for the global energy sector to achieve the energy-related Sustainable Development Goals (SDGs) and reach maximum net-zero CO₂ emissions by 2050. This is the most ambitious decarbonization scenario.³

³ To assess the impact of global decarbonization, Andrian and Álvarez (2023) also develop two additional scenarios, the prices of a barrel of oil in 2050 at USD 50 and USD 70.

Figure 4. Scenario of a Fall in the Global Oil Price

Source: Authors' calculations.

- b)** The energy transition scenario is modeled through an increase in energy efficiency or more precisely, a reduction in the amount of petajoules (PJ)⁴ used by different industries and households while the demand for energy services is kept constant (for example, heating and transportation).⁵ In fact, this scenario introduces an increase in sectoral productivity through a reduction in energy needs per unit of production.
- c)** The scenarios of financing the energy transition are constructed as follows: three trajectories of additional investment costs are assumed for financing new technologies: 1, 2, and 3 percent of GDP. These assumptions are based on recent studies that find that for developing countries, annual investments could reach up to 2.4 percent of GDP on average (IMF, 2023) to meet other SDGs, or in the case of Latin America and the Caribbean (LAC), where annual investments may range from 2.2 to 3 percent of GDP in order to meet nationally determined contributions (ECLAC, 2023). Additionally, it is assumed that 70 percent of the investment will originate from private sources of financing and 30 percent from public sources; these values are close to those assumed by the IEA (2023) for LAC. The rationale for analyzing three investment values lies in the fact that there may be scenarios in the future where the cost of new technologies could decrease. Finally, different sources of financing for this investment are analyzed: (1) external and domestic debt, (2) direct taxes, and (3) a mix of direct taxes and taxes on the use of fossil fuels.

To understand the impact of each aspect of the decarbonization process, the different shocks are introduced in isolation. First, the base scenario (absence of shocks) is analyzed. Second, the behavior of the Andean economies under the trajectory of oil prices in the NZE scenario is observed. Third, the

⁴ One petajoule (PJ) equals a quadrillion (10¹⁵) joules. A joule is a unit of energy equaling 0.24 calories. For example, 1 PJ = 31.6 million m³ of natural gas or 278 million KWh of electricity.

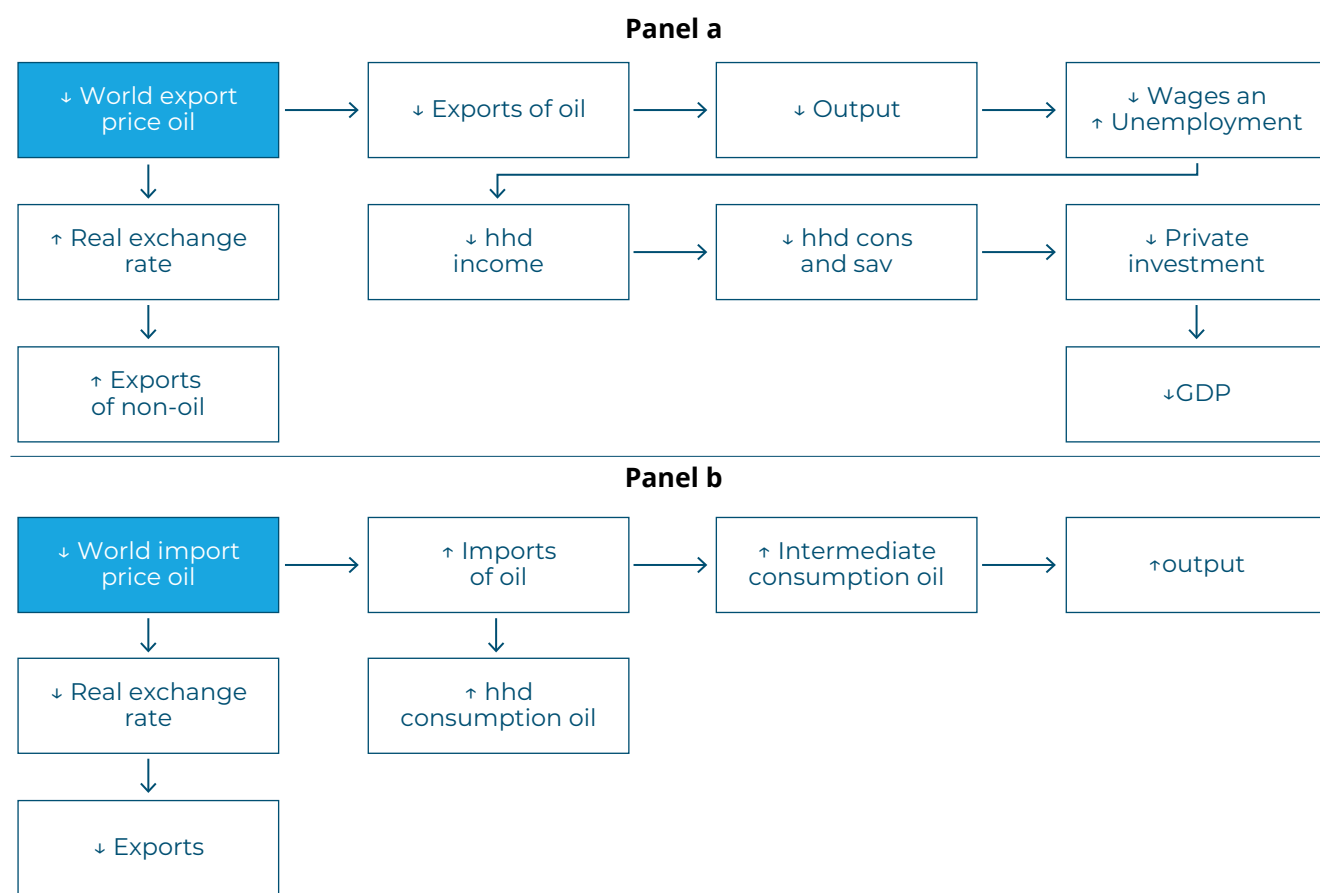
⁵ The input for this scenario on the energy demand of different productive sectors and households was obtained from the simulations conducted in Chapter 2 of Andrian and Álvarez (2023).

technological change produced by the transition to cleaner energies is described. Finally, the scenarios of financing the transition under different financing instruments are analyzed.

C. Transmission channels

To have a better understanding of how the different shocks or policy instruments operate in the Andean economies in the CGE model, we briefly describe the transmission channels. Panels a and b of Figure 5 show the main transmission channels in play, when a drop in the world price of hydrocarbons is simulated, for hydrocarbon-exporting and importing countries, respectively. In the first case (panel a), the deterioration of the terms of trade has negative impacts on production and factor income. Next, the reduction in household and business income has negative consequences for private savings and investment. On the other hand, the real exchange rate must depreciate to keep the balance of the current account of the balance of payments constant. Consequently, imports are reduced while exports of other products are promoted. In the second case (panel b), a decrease in oil price leads to rises in oil imports and consumption in households and intermediate levels, which are expected to have a positive effect on GDP. In addition, the real exchange rate appreciates to balance the current account, thus increasing exports.

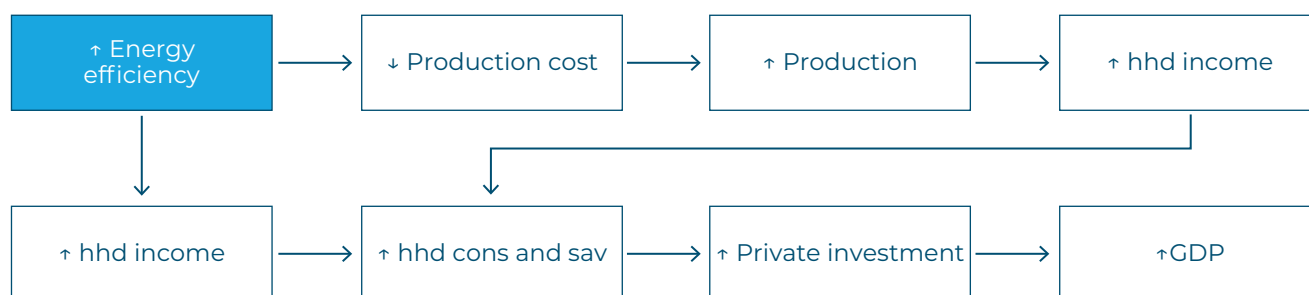
Figure 5. Transmission Channels of Price Variation for Oil-Exporting and Importing Countries



Note: hhd denotes households, cons denotes consumption, and sav denotes savings.

Figure 6 summarizes the transmission channels of technological change produced by the energy transition. On the one hand, the improvement in energy efficiency reduces production costs and increases firms' profits, with household income rising as a result. On the other hand, an increase in energy efficiency also reduces households' energy expenditures, thus increasing their disposable income and consumption of other goods. Additionally, it causes savings to increase, consequently boosting private investment. In both cases, economic activity increases.

Figure 6. Transmission Channels of Energy Efficiency



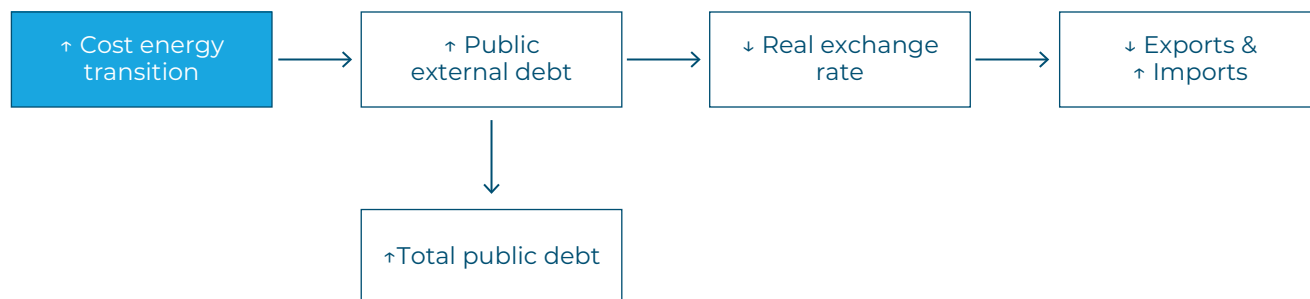
Note: hhd denotes households, cons denotes consumption, and sav denotes savings.

Figure 7 shows the transmission channels of financing the cost of the energy transition using different instruments (the change in productivity and its effect on economic activity is already captured in Figure 6). Financing the energy transition with external debt (panel a) has no clear impact on GDP, but it does on the composition of the balance of payments. The increase in the debtor position with respect to the rest of the world increases external debt, its correlate being a deterioration in the current account balance. In other words, the inflow of resources from the rest of the world (in the form of debt) causes a real appreciation, making domestically produced goods more expensive compared to foreign goods, which leads to a decrease in exports and an increase in imports. Financing the energy transition “domestically” with taxes results in a decrease in economic activity, due to both an increase in income taxes (panel b) and a tax on the use of fossil fuels (panel c).⁶

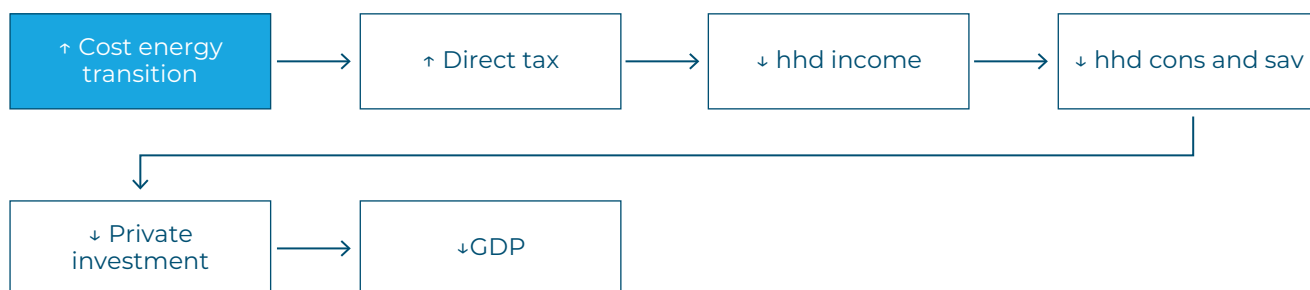
⁶ For further details on the impact on the economy of increasing these taxes (panels b and c of Figure 7), refer to Andrian and Álvarez (2023).

Figure 7. Transmission Channels of Financing the Energy transition with Different Fiscal Instruments

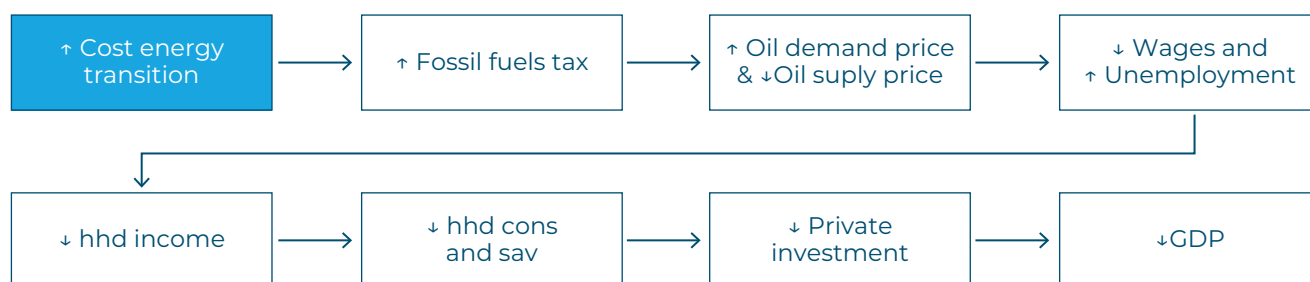
Panel a



Panel b



Panel c



Note: hhd denotes Households, cons = consumption and sav = saving

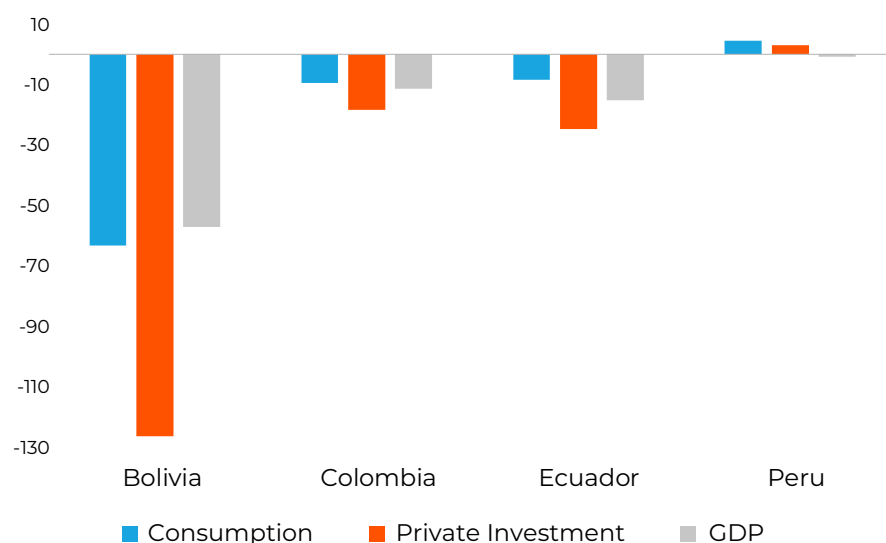
4. The NZE scenarios' results

A. Fall in oil price

One of the main challenges posed by the global decarbonization process for Andean economies (except for Peru) is the potential long-term drop in oil prices, leading to the phenomenon of “stranded assets” (Andrian et al., 2024). Hydrocarbon production in the Andean region impacts fiscal balances and external accounts, affecting the performance of those economies. This section examines the impact on the growth and welfare of Andean countries from a long-term drop in oil prices compared to the base scenario.

The collapse in prices would lead to a decrease in household consumption and private investment (Figure 8). The economy showing the greatest impact would be Bolivia, with a consumption level 60 percent below the base scenario. For Colombia and Ecuador, the negative impact would be smaller, with consumption levels between 9 and 8 percent lower than the base scenario. Private investment would follow the same trends as private consumption, with the slower pace of capital accumulation impacting the economies' performance. It is worth noting that in this scenario, governments would compensate for the loss of income generated by the reduction in the global price of hydrocarbons through direct taxes, because without fiscal adjustment there would be an explosive and unsustainable trajectory of public debt (Andrian et al., 2024). Additionally, the worsened terms of trade and narrower fiscal policies would negatively impact the performance of Andean economies. In relative terms, the size of Bolivia's economy shrink to less than half compared to the base scenario, while the economies of Colombia and Ecuador would be 11 and 15 percent smaller, respectively. In the case of Peru, consumption, private investment and GPD are expected to remain at levels similar to those in the base scenario.

Figure 8. Macroeconomic Indicators under Fall in Oil Price Scenarios (Deviation from 2050 Baseline, %)

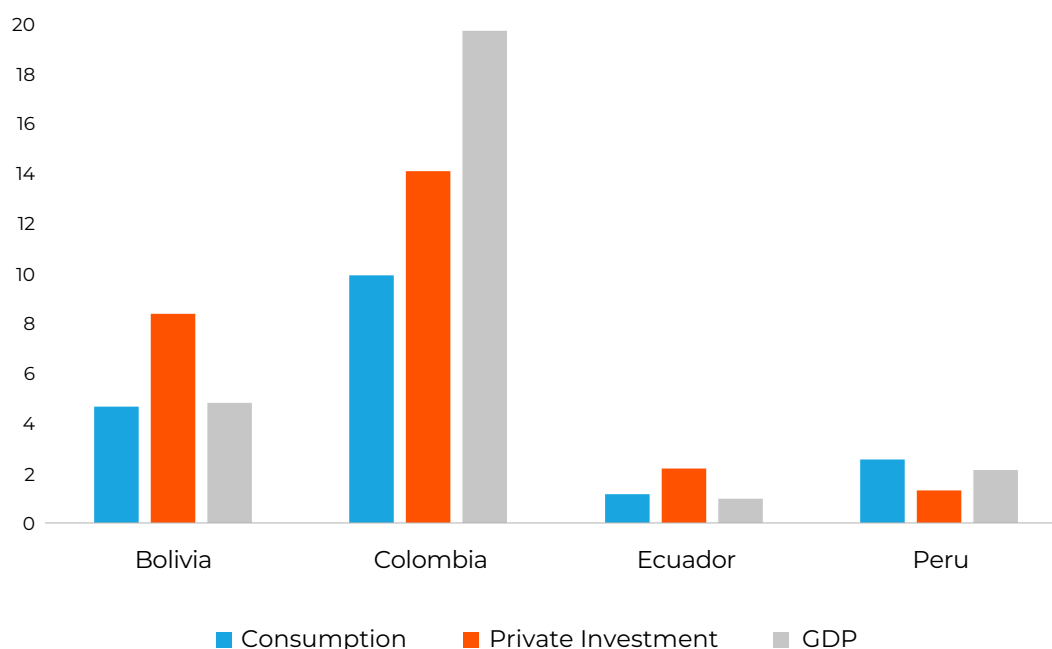


Source: Authors' calculations.

B. The energy-efficiency scenario

The energy transition would bring about an improvement in terms of the efficiency of energy use.⁷ For example, an electric car can travel more kilometers with the same amount of energy than an internal combustion car. This savings of energy means that the production of goods and services that use energy as an input becomes more productive and that households need to spend less income on their energy demand. These facts free up resources that in turn can support greater growth in economic activity. Figure 9 shows the impact of energy efficiency improvements in the Andean countries compared to the baseline scenario. In all cases, an increase in consumption, investment, and GDP is observed. Variations between countries are due to different factors: initial conditions of the countries, basket of sources for the production of electricity,⁸ and scope of activities reported.⁹ Given the particularities in each country, Colombia would realize the most significant efficiency gains, as evidenced by a GDP that could be 20 percent higher than the baseline scenario, with the GDP increasing to a much lower extent in Bolivia (5 percent), Peru (2 percent), and Ecuador (1 percent).

Figure 9. Macroeconomic Indicators under the Energy Efficiency Scenario (Deviation from 2050 Baseline, %)



Source: Authors' calculations.

⁷ For more details, see Andrian and Álvarez (2023), chapter 2.

⁸ For more details see Andrian and Álvarez (2023), chapter 2.

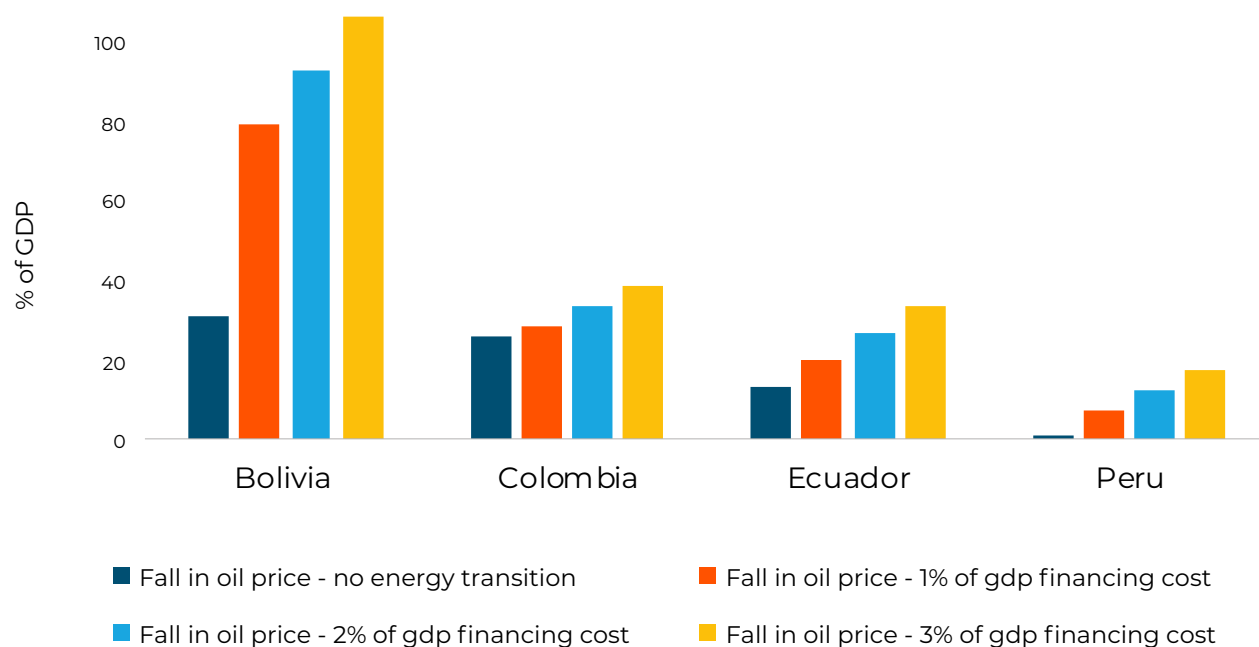
⁹ In the case of Peru, information is only available for the transportation sector.

C. Financing the energy transition with debt

In this and subsequent sections, different instruments for financing the domestic energy transition are analyzed under the two scenarios discussed above. That is, we analyze economies facing a substantial drop in the price of oil (scenario analyzed in Section 4.a) and energy efficiency gains (scenario in Section 4.b), but we add the investment (with three versions of sourcing) needed to make the domestic energy transition a reality.

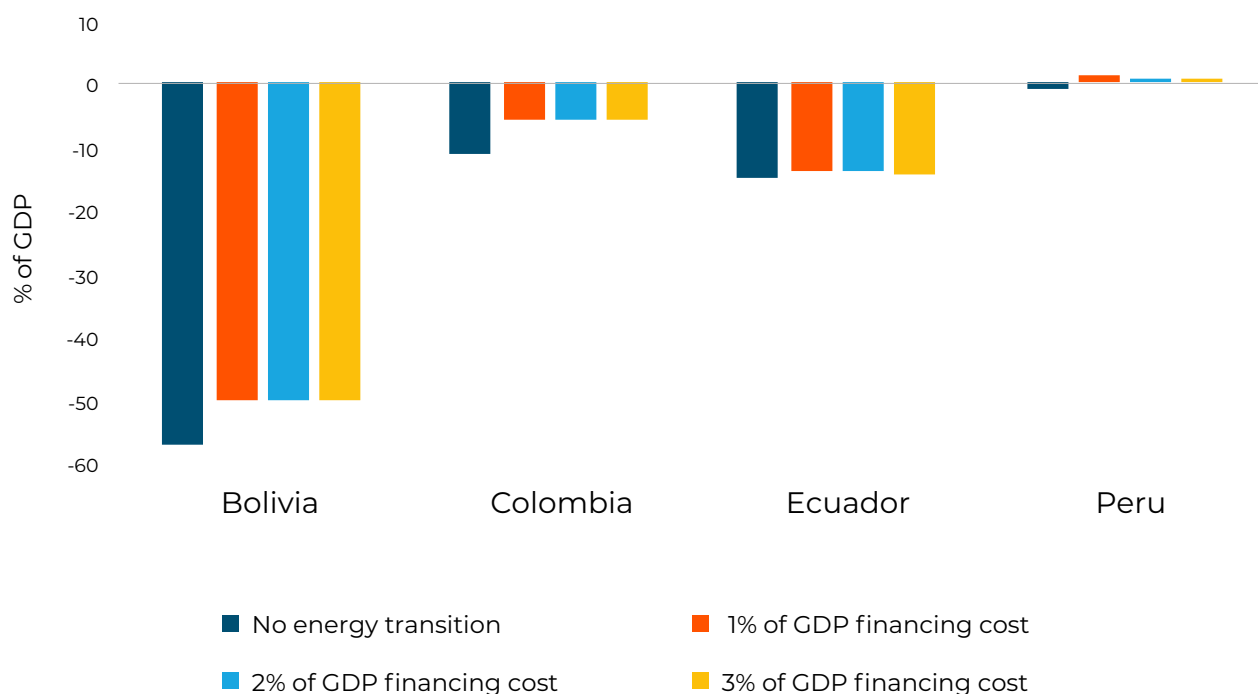
The first financing instrument is the use of external debt. The salient aspect of this scenario is that it provides an estimate of the financing needs that the Andean economies would face to carry out the energy transition. Figure 10 shows the additional external debt in the public sector in the stranded assets scenario (no energy transition) and in the scenarios of financing the transition with external debt. In extreme cases (amount of financing equivalent 3 percent of GDP), in Bolivia the debt could reach more than 75 percentage points (pp) of GDP additional total public external debt under the scenario without financing and total financing needs of 106 pp under the baseline scenario. In intermediate cases such as Colombia and Ecuador, external debt could reach 33 to 39 pp of GDP compared to the baseline scenario, with Peru seeing the smallest increase in debt, 18 pp of GDP. These values indicate how costly and even unsustainable it would be to finance the energy transition with external debt in a scenario of falling oil prices. Even for an economy like Peru, where a fall in oil prices would have no effect, financing the energy transition may be onerous. These results underscore the need of coordinated fiscal policy and diversification of the Andean economies through investment in other non-oil-dependent sectors (Andrian and Álvarez, 2023)

Figure 10. Financing the Energy Transition with External Debt, Government Foreign Debt Stock (GDP Deviation from 2050 Baseline)



Analyzing these scenarios is also useful for understanding the effects on the macroeconomy. Figure 11 shows the impact on GDP. Because the financing of the energy transition makes use of external resources, it has no impact on the production, investment, savings, and consumption decisions of households (see Section 3.c on transmission channels). This implies that aggregate economic activity is not strongly affected, though the resulting improvement in energy efficiency does have a positive impact (similar patterns are observed for household consumption and private investment).

Figure 11. Financing the Energy Transition with External Debt, GDP (Deviation from 2050 Baseline, %)

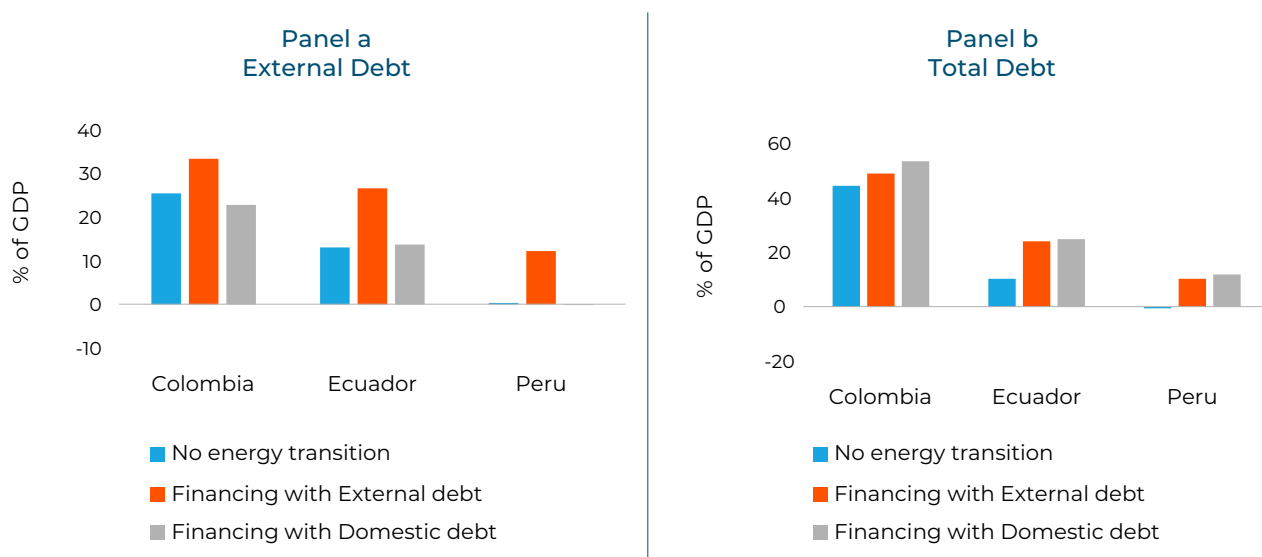


Source: Authors' calculations.

Another possibility is financing the energy transition with domestic public debt. For practical purposes we only consider a middle scenario in which the financing cost is 2 percent of GDP.¹⁰ Panel a of Figure 12 shows that the external public debt would not increase with respect to the scenario without the energy transition, while the total public debt (panel b) would increase between 0.7 pp of GDP (Ecuador) and 4.7 pp (Colombia). This increase in debt is explained by the additional drop in growth that would occur under the external debt financing scenario (Figure 13); the increase in domestic debt would crowd out total investment, reducing growth and tax collection and increasing the fiscal deficit.

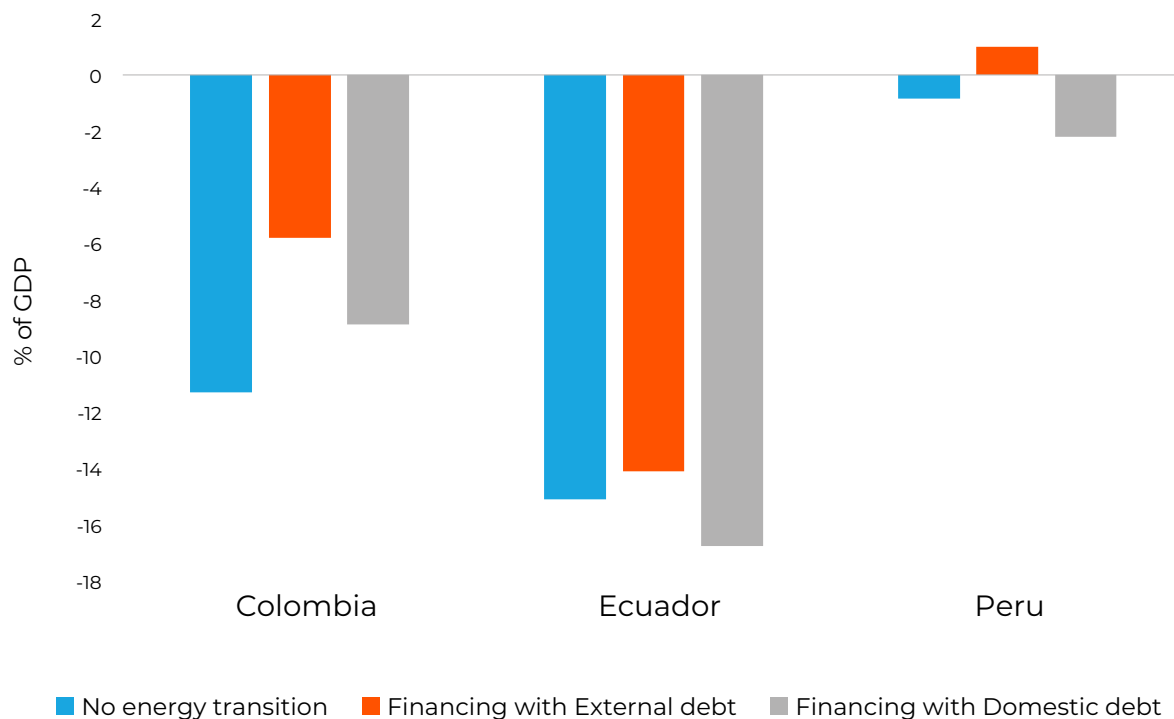
¹⁰ This scenario could not be constructed for Bolivia because, when added to the reduction in the level of activity experienced by the economy in the scenario of lower global hydrocarbon prices, the crowding out effect of private investment is too strong. In other words, due to the reduction in the level of economic activity, the Bolivian private sector cannot assume the cost of financing the public investments necessary for the energy transition.

Figure 12. Financing Energy Transition with Domestic Public Debt (2% of GDP Scenario), Government Debt Stock (GDP Deviation from 2050 Baseline, %)



Source: Authors' calculations.

Figure 13. Financing the Energy Transition with Domestic Public Debt (2% of GDP Scenario), GDP (Deviation from 2050 Baseline, %)



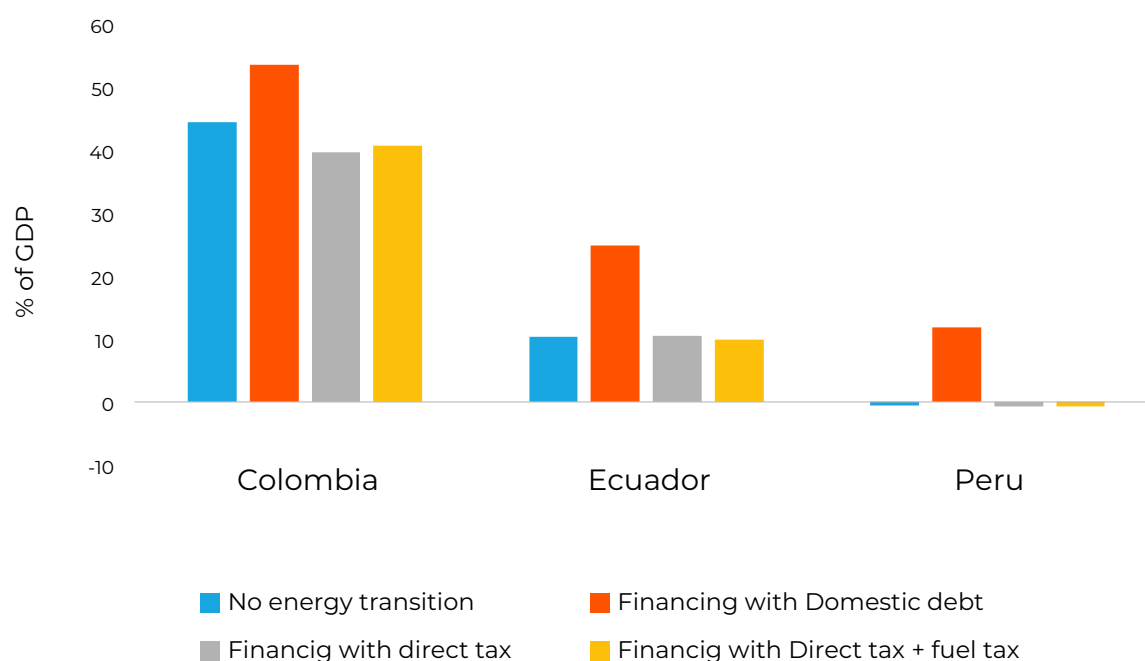
Source: Authors' calculations.

Note: This scenario could not be simulated for Bolivia.

D. Financing the energy transition with taxes

Finally, the possibility of using taxes to finance the energy transition is analyzed (again, only the scenario with a financing cost of 2 percent of GDP is considered). Two types of taxation are used: (1) an increase in income tax to cover the financing cost, and (2) a 20 percent tax on the use of fossil fuels complemented with an income tax increase to cover the remaining financing cost.¹¹ A salient aspect is that the inclusion of taxes allows public debt to be lower (or equal as share of GDP, in the case of Ecuador) than the debt that would be observed in the scenario without the energy transition (Figure 14). In turn, the negative effect on growth is smaller than when using domestic debt (Figure 15), and slightly larger when the combination of income tax and fossil fuel tax is used except in the case of Colombia, where the effect is almost the same. This shows that the impact of crowding out on economic activity is greater than the impact of the imposition of the tax. At the same time, it is worth emphasizing that there may be a trade-off between the instruments used and exports: the appreciation of the real exchange rate resulting from the use of external debt as a financing mechanism has a negative impact on exports.

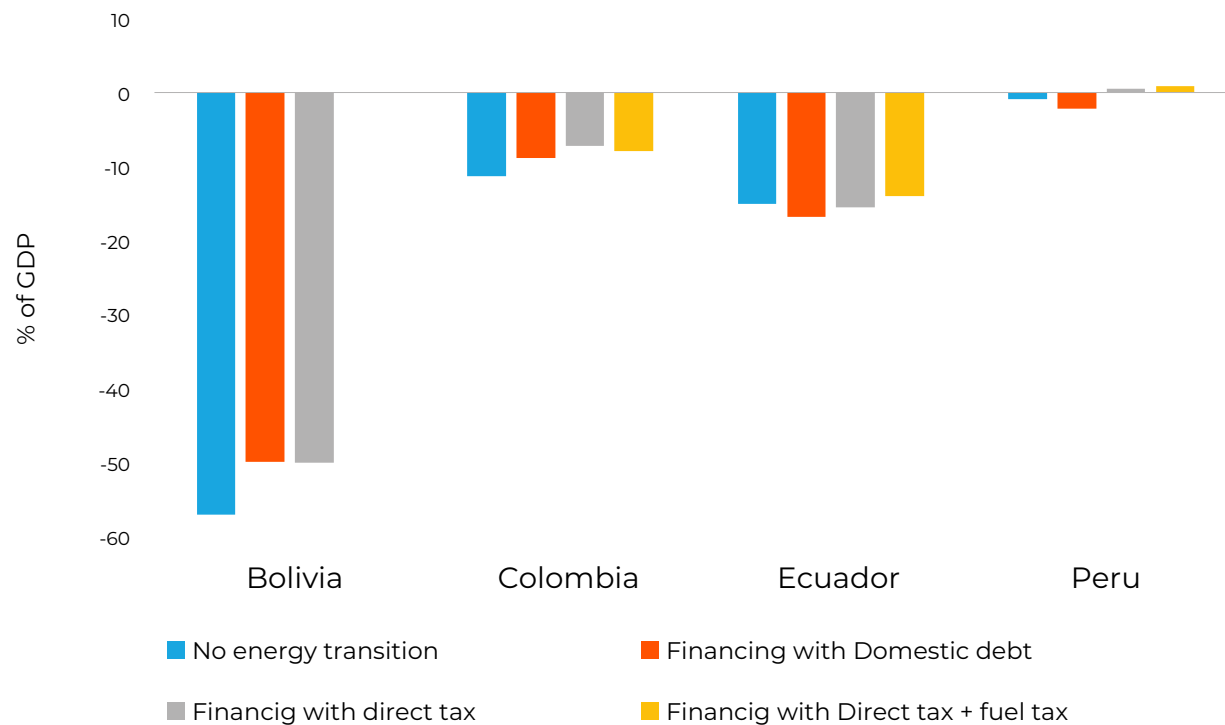
Figure 14. Financing the Energy Transition with Taxes, Total Public Debt (GDP Deviation from 2050 Baseline, %)



Source: Authors' calculations.

¹¹ In the case of Bolivia, the introduction of the fossil fuel use tax fails to generate additional tax revenues (see Andrian and Álvarez (2023), chapter 1 for more details), so that the financing of the energy transition could only be simulated with direct taxes.

Figure 15. Financing the Energy Transition with Taxes (2% of GDP Scenario) (GDP Deviation from 2050 Baseline, %)



Source: Authors' calculations. Conclusions

5. Conclusion

As the global economies move toward a low-carbon future, it is imperative to comprehend the nuanced economic implications of this transition, particularly for regions like the Andean nations. By fostering collaboration between governments, businesses, and civil society and implementing targeted policy measures, these countries can navigate the challenges of decarbonization while harnessing the transition's transformative potential for sustainable development. Through rigorous analysis and strategic planning, we can pave the way for a more resilient and prosperous future for the economies of the Andean region amid the energy transition.

The conclusions drawn from our analysis shed light on the multifaceted nature of the energy transition and its implications for economic development in the Andean region. While the transition holds promise for enhancing economic productivity, it also entails significant costs and challenges that must be carefully addressed through targeted policy interventions.

Firstly, the energy transition, while beneficial for economic productivity in the long run, is not without its costs. The shift to cleaner energy sources requires substantial investments in renewable infrastructure, technology innovation, and human capital development.¹² These upfront costs may pose challenges for governments, particularly in the context of constrained fiscal budgets and competing development priorities.

Moreover, the impact of the energy transition on economic outcomes will vary, depending on the initial conditions and specific circumstances of each country. Factors such as composition of energy sources, industrial structure, technological capabilities, and policy frameworks will influence the magnitude and distribution of economic benefits and costs associated with the transition (Andrian & Álvarez, 2023).

Furthermore, the energy transition is likely to occur in a context characterized by stranded assets, wherein investments in fossil fuel infrastructure become economically unviable due to regulatory, technological, and market changes. This phenomenon may pose additional challenges for countries heavily reliant on hydrocarbon industries, exacerbating the difficulty of achieving a successful transition. However, Peru, as a net importer of hydrocarbons, may experience a somewhat different trajectory that presents unique opportunities and challenges.

In light of these complexities, crafting an effective fiscal framework to finance the energy transition requires careful consideration of each country's specific circumstances and challenges. Access to external markets, the potential for crowding out in domestic economies, and the level of tax pressure are all critical factors that must be taken into account.

In particular, policymakers must explore a diverse range of fiscal instruments tailored to their country's context.¹³ Carbon-pricing mechanisms, such as taxes or cap-and-trade systems, can incentivize emission reductions while generating revenues to finance the transition.¹⁴ However, the design and implementation of such mechanisms must be carefully calibrated to minimize adverse effects on households and businesses, particularly in low-income and vulnerable communities.

Moreover, addressing the issue of low tax revenue collection, especially in the Andean region, requires comprehensive tax reforms aimed at broadening the tax base and enhancing compliance (de la Cruz et al., 2020). Efforts to improve the efficiency of public expenditure can also play a crucial role in mobilizing resources for the energy transition (de la Cruz et al., 2020). By reallocating funds toward priority areas and

¹² See Andrian and Álvarez (2023), chapter 2.

¹³ See de la Cruz et al. (2020) for a menu of fiscal instruments available tailored to each Andean country.

¹⁴ See Andrian and Álvarez (2023), chapter 1.

eliminating inefficiencies, governments can create the fiscal space to finance investments in clean energy infrastructure and technology.

However, unlocking the full potential of these fiscal instruments hinges on overcoming institutional and structural barriers, including rigidities in public expenditure¹⁵ and limited access to financial markets. Building a conducive environment for sustainable development requires concerted efforts to enhance financial deepening, promote long-term savings, and foster a culture of investment in productive sectors beyond the energy industry.

In conclusion, navigating the energy transition in the Andean region demands a comprehensive and coordinated approach that addresses the complex interplay of economic, social, and environmental factors. By leveraging a diverse set of fiscal instruments, mobilizing domestic and external resources, and promoting inclusive and sustainable development strategies countries can unlock the transformative potential of the energy transition while advancing their broader development objectives. While the challenges ahead are formidable, the opportunities for fostering a more resilient, equitable, and sustainable future are within reach, if policymakers and stakeholders remain committed to collaborative action and evidence-based decision-making.

¹⁵ See Andrian et al. (2020).

Public and Private Investment in the Andean Region

2. PUBLIC AND PRIVATE INVESTMENT IN THE ANDEAN REGION: OPPORTUNITIES AND CHALLENGES AT THE NATIONAL AND SUBNATIONAL LEVELS

DMITRI FUJI, MAURO DÍAZ, ALEXIS MILO AND FERNANDO APORTELA

1. Introduction

In the current global context, both developed economies as well as developing countries face considerable challenges, with the COVID-19 pandemic or climate change being clear examples that have tested the response capacities of public policy in the presence of extreme scenarios. In that sense, climate change is increasingly being perceived as an urgent and serious problem that needs to be solved by contemporary society.

As it is well known, in the last United Nations Climate Change Conference (COP28 in Dubai), the need to transition towards clean types of energy was highlighted once again, leaving behind the need for fossil fuels.

As pointed out in said Conference by the Executive Secretary of the United Nations Framework Convention on Climate Change, Simon Stiell, “the highest climate ambition means more jobs, stronger economies, stronger economic growth, less pollution, better health. Much more resilience protecting people in every country from the climate wolves at our doors.”

Although the issue is increasingly relevant in the public policy agendas of both developed and developing countries, it must be recognized that progress has not been made at the speed required to achieve measures to mitigate climate change. From the review of experiences in various regions of the world, factors have been detected that limit the implementation of public policies and the development of productive projects, through public and private financial instruments (see Box 1.1). These limiting factors increasingly represent barriers that prevent a sustained and long-term commitment to protect the world’s population from humanity’s main climate problem: the use of fossil fuels and their pollution.

Box 1.1 Factors that limit the implementation of public policies and the development of productive projects in the issue of decarbonization

- Regions and countries have not taken advantage of the existence of alternative sources of energy to protect the local environment.
- National and subnational authorities have not valued the importance of investing public resources nor sought private resources to define concrete actions towards an agenda of development.
- International finance funds and companies have not been perceived as an opportunity to improve the quality of life of the inhabitants.
- Subnational public and private initiatives have been limited and ineffective to attract greater investment or greater public interest.
- The transition from traditional to clean sources of energy has a considerable impact on economies that depend on hydrocarbons, both in their contribution to the GDP and in terms of employment.

The Cost of Not Decarbonizing

There are several recent studies that point out that the cost of continuing with the use of traditional sources of energy will increase over time, while, on the contrary, the costs of alternative sources of energy have decreased, thus becoming more attractive to use.

For example, according to a study commissioned by the Parliament of the United Kingdom, between 2010 and 2021, the average global cost of electricity generation for renewable technologies throughout their life cycle (including production and operation costs) has decreased: 88% in the case of solar photovoltaic energy (solar panels); 68% in the case of onshore wind energy; and, 60% in the case of offshore wind energy. Additionally, the International Energy Agency (IEA) estimates that these costs will decrease at an additional range of 15% to 35% for 2024.

The economic advantages of using renewable energy are becoming increasingly tangible. For example, there are calculations that indicate that electricity from fossil sources costs between 5 and 17 cents per kwh, higher than solar generation, which averages between 3 and 6 cents per kwh. The analysis also shows that generation via polluting sources with traditional sources of energy implies assuming higher costs both in terms of recognizing international agreements and in the thermodynamic efficiencies that this implies.

Furthermore, fossil fuels are subsidized in many countries, with tax incentives for consumption, investment and maintenance of transportation and storage infrastructure, which means that the costs of generation based on this type of energy are not fully revealed. Additionally, hydrocarbon production processes have effects on water, impacts on the subsoil and pollution in the air due to evaporated chemicals, with the costs that this implies for the population.

The Importance of the 2030 Agenda

The 2030 Agenda for Sustainable Development was approved in September 2015 in the General Assembly of the United Nations with a vision of specific actions and commitments from both developed and developing countries. Specifically, for the purposes of this analysis, we focus on Goal 7 of Agenda 2030 to “Ensure access to affordable, reliable, sustainable and modern energy for all”. To better understand the scope of this objective within the 2030 Agenda, it is important to review its goals.

Targets of Goal 7 between now and 2030:

- » Ensure universal access to affordable, reliable and modern energy services.
- » Increase substantially the share of renewable energy in the global energy mix.
- » Double the global rate of improvement in energy efficiency.
- » Enhance international cooperation to facilitate access to clean energy research and technology, including renewable energy, energy efficiency and advanced and cleaner fossil-fuel technology.
- » Promote investment in energy infrastructure and clean energy technology.
- » Expand infrastructure and upgrade technology for supplying modern and sustainable energy services for all in developing countries, in particular least developed countries, small island developing States, and land-locked developing countries, in accordance with their respective programs of support.

According to recent UN work, the world is moving towards achieving Goal 7 with encouraging signs that energy is becoming more sustainable and widely available. Access to electricity in the poorest countries has begun to accelerate, energy efficiency continues to improve, and renewable energy is achieving excellent results in the electricity sector. Despite this, greater attention needs to be paid to improvements in access to clean and safe cooking fuels and technologies for 3 billion people beyond the electricity sector.

Some notable data on Goal 7 from UN reports indicate that 13% of the world’s population still lacks access to modern electricity services, while 3 billion people rely on wood, coal, charcoal, or animal waste for cooking and heating. Furthermore, energy is the dominant contributor to climate change, accounting for around 60% of total global greenhouse gas emissions, and indoor air pollution from using fuel for domestic energy caused 4.3 million deaths over a decade ago.

Climate Change and Renewable Energies

Continuing with the line of climate change and the projections of the main international agencies, the energy sector is the source of approximately three quarters of annual global greenhouse gas emissions. Reducing these emissions before 2050 is key to preventing temperatures from rising more than 1.5 °C. According to the International Energy Agency in its document “Net zero by 2050” (2021), to achieve the Paris Agreement goal of limiting warming to 1.5°C, the development of fossil deposits and the construction of new coal-fired power plants must be completely suspended.

Additionally, a comprehensive transformation of the production, transportation and use of energy is required, aiming at energy efficiency measures with the objective of reducing energy consumption by 7.5% by 2050 in relation to 2020. In this context, achieving net-neutral greenhouse gas emissions in the energy sector by 2050 requires new technologies that are not yet on the market. It will be necessary to invest in better batteries, hydrogen, and CO₂ capture and storage. One of the most relevant measures will be to drastically modify the global energy consumption matrix, reducing the participation of fossil fuels from the current 79% to 23% by 2050 and increasing renewable energies from 26% to 66% in the same period.

This measure of massifying renewable energies occurs within a framework of strong reductions in the generation costs of the main renewable energies (bioenergy, solar and wind), which places them at competitive margins compared to their fossil competitors. To expand the use of renewable energies and promote their competitiveness, it will be essential to explore measures to reduce greenhouse gas emissions.

The Outlook in Latin America and the Andean Region

The Andean Region cannot remain oblivious to the potential benefits of the global energy transition. The International Energy Agency estimates that, between 2023 and 2050, global demand for oil will be reduced by half and between 2030 and 2050, the demand for natural gas will be reduced by a third. This will cause producing countries in the region to see their hydrocarbon exports reduced. However, the same source estimates that in a sustainable scenario between 2020 and 2040, global demand for lithium, graphite, cobalt, nickel, rare earths, manganese and copper will multiply by 40, 25, 20, 18, 5, 6 and 3 times, respectively. This means that the countries of the Andean Region will receive large income from the export of metals critical for sustainable technologies due to their large deposits, as is the case of Bolivia (lithium), Colombia (manganese) and Peru (copper). The value of these deposits is estimated in multiples of GDP and under an adequate regulatory framework, their exploitation can bring great benefits.

Recognizing that the Andean Region is not exempt from the global climate problem and that public policy decision-making must focus on its mitigation, it becomes necessary to find clean energy alternatives that allow sustainable development of society in the 4 countries. The projects that must be carried out necessarily require the participation of public and private investors, directing efforts towards productive projects that generate greater added value at the national and subnational level for the benefit of the general population; furthermore, this participation must be accompanied by a local and international diagnosis that allows to identify the role played by the financial instruments selected for each case.

Therefore, this document contributes with elements for the discussion on public policy alternatives to deal with climate change in the Andean Region, focusing on three fundamental aspects: (i) the current conditions of the Andean Region and its capacity to develop productive projects towards decarbonization; (ii) the different instruments of public policy and international private funds, with the experience of their implementation in recent years; and, (iii) alternatives of financial instruments already existing in other countries, emphasizing the Mexican market in particular, which can be used as vehicles for investment in the Andean Region.

2. The Local Conditions of Andean Countries to Receive External Economic Resources and Other Benefits Towards the Transformation of the Productive Sector

Characteristics of the Andean Region.

The Andean Region, comprised by Bolivia, Colombia, Ecuador and Peru for the purposes of this study, had a population of approximately 117 million people as of 2023. According to preliminary numbers of the International Monetary Fund (IMF), its growth was below that of the region as a whole, which was estimated to be 1.6% in 2023, where the national income of Bolivia, Colombia, Ecuador and Peru expanded 1.8%, 1.4%, 1.4%, and 1.1% respectively. The GDP of the Andean Region equals approximately half that of Mexico.

The Andean Region faces low levels of savings and investment. In accordance with calculations of the IMF, Bolivia, Colombia, Ecuador and Peru registered national savings rates of 10.3%, 12.2%, 24.1%, and 19.1% as proportion of their GDP, respectively. This in turn entails low investment rates, which for the abovementioned countries were 15.1, 17.1%, 22.6%, and 21.0%. In spite of these levels, the difference between savings and investment is considered to involve the fact that the region is well positioned to capture external savings and that the marginal productivity of the capital is high in those countries.

The Andean Region is well-known for its biological, cultural, and climate diversity, the expanse of its forests, occupying 50% of the territory and harboring one of the most important water reservoirs in the world, which now faces a serious threat due to climate change and, like many other regions around the globe, has already experienced its first effects, such as global warming or the presence of increasingly polluted cities. Recent analysis identified the decrease of water availability as one of the main concerns of the region, which produces 10% of the planet's water, which mainly comes from ecosystems of the High Andes and glaciers, which mostly flow into the Amazonia. The level of this water system has been observed to be affected, and the risk of having an increasingly complicated access to water, as harbinger of activities such as agriculture or related services is undoubtedly one of the main concerns of local authorities and international experts.

According to recent analysis of entities such as comunidadandina.org, the increase of emergencies due to floods, droughts, landslides, and freezes, among others, has revealed the vulnerability of the Andean Region in the face of climate change, as well as the need to increase the response capacity to its effects. Considering this situation, the need to implement processes for planning, decision-making, and driving productive projects coordinated between the local community and international bodies, so that public and private funds can be acquired and used to counteract recently identified effects.

Issues such as food and energy security, guaranteeing water supply, and an effective control of deforestation, are highlighted as crucial when defining local and subnational work agendas, as well as the linkage with international bodies. These issues require joint work, based on robust analyses, and public and private investment proposals, aimed at triggering productive projects that enable greater economic and social benefits in the region.

An additional aspect to be considered is that of greenhouse gas emissions, which, although they are still scarce in the countries mentioned, will probably increase with the economic growth of developing countries, surpassing those of developed countries that are progressively implementing measures to eradicate said emissions.

The Andean Region in the Setting of Climate Change, Renewable Energy and Relocation

For this subsection of our analysis, we carefully considered one of the most recent and impactful documents of the United Nations Environment Program (UNEP) with regard to: Zero Carbon Latin America a pathway for net decarbonization of the regional economy by mid-century, prepared by Vergara, Fenhann and Schletz in 2016, while also adding information relevant to illustrate the current context of the region.

According to the study, both developed and emerging economies, as well as the international context within which they interact, have faced a series of events that have been structurally and asymmetrically transforming their global production processes, directing them towards new local dynamics and commercial interaction.

The ratification of the Paris Agreement in 2021 within the framework of COP26 reaffirmed the global commitment to continue efforts aimed at adopting policies to combat global warming and adapt to its effects, in addition to the changes in digitalization and automation induced by the pandemic. The shock of the COVID-19 pandemic exposed socioeconomic fragilities on a global scale, domestic and sectoral heterogeneities and revived the productivity agenda for growth, all of which has been integrated into the 2030 Agenda for Sustainable Development (already mentioned in the Introduction) which, among its seventeen Development Goals, happens to include climate action. These actions would have substantial impacts not only on the production of primary energy-related products, but also on their trading partners and countries whose Global Value Chains (GVCs) are, directly or indirectly, linked to the main executors of change.

These adjustments could alter the GVCs, which although it would open opportunities - such as manufacturing energy-efficient machinery and equipment and reconditioning infrastructure - would also mean reviewing both the energy generation matrix and the production processes. Although some of these adjustments (such as infrastructure) are labor intensive, most productive changes involve transitions toward greater capital intensity. In this way, keeping the climate objective alive will have the challenge of achieving important improvements in energy efficiency, the review of GVCs, the diversification of the productive structure and the expansion of the range of options that not only compensate for the closest losses with energy transition, but that allow obtaining a net benefit through operational energy savings and income from ecosystem services.

This is the result of the continuous search by companies to improve performance and the scope of their internal processes, and in their relationships with customers and providers. Even though the world economy recovered and grew 6.3% in 2021, the nearest outlook is still far away from that observed before the pandemic, with challenges still persisting in the medium term.

It is also worth mentioning that poverty and employment have yet to reach their 2019 levels, and even more recently, the conflict in Ukraine has had repercussions on the economies of Andean countries. The world is feeling the consequences of the war between Russia and Ukraine through the pressure on the international prices of food and energy, disruptions in the international supply chains, and greater volatility in the financial markets. This additional deterioration of the international situation generates pressure on countries to implement new tax incentives in favor of the most vulnerable populations. Nonetheless, the war has also entailed an increase in the international prices of raw materials, which could offer an opportunity for those economies that depend on the export of said resources.

Although high prices generate incentives to reduce the consumption of these fuels, there are short-term consequences in inflation and in the investment decisions made in the sector. Similarly, the pandemic has entailed a breaking point for digitalization and automation, with COVID-19 posing a challenge

without precedents with regard to the economic sustainability of companies, and it has generated radical changes in the way people live, work, and consume. Specifically, workers, providers, and clients are progressively opting for contactless interactions.

These events rapidly increased the need of companies for greater modernization, to the point that in a few months a level of digital technology has been adopted that would have been achieved in several years if the pre-pandemic pace had been maintained. This greater technological adoption occurred, mainly, through tools that facilitated connectivity, remote work, virtual customer service, as well as the use of advanced technologies in internal operations and decision making.

The pandemic caused important changes in GVCs. Physical distancing restrictions and temporary industrial and business closures led to a global container shortage, which led to the exponential escalation of market costs for shipping. For example, the cost of shipping a 40-foot container from China to the West Coast of the United States went from US\$1,500 in January 2020 to US\$4,000 in 2024 (a situation worsened by the events in the Red Sea).

This entire context has affected the services sector and is affecting the pace of productive transformation, something that has positive and negative impacts on employment. In 2020, the services sector represented approximately 65% of the world's Gross Domestic Product (GDP), a figure similar to the weight it has on the GDP of Latin America and the Caribbean (67%), and close to 45% of employment in emerging countries. Furthermore, the internal value added of services in Latin America and the Caribbean is relatively high, representing 92.1% of the total.

Under the environment described above, it is clear that the Andean Region has important productive challenges. The productive structure will be affected by the trend towards decarbonization, resulting in winning and losing sectors. According to a joint report between the Inter-American Development Bank and the International Labor Organization (IDB and ILO, 2020), at least 7.5 million jobs associated with fossil fuel extraction and fossil fuel-based electricity generation, as well as animal food production, are at risk of being lost by 2030. However, it is estimated that the net gain in jobs will double in favor of sectors related to agriculture, plant food production, forestry, construction, manufacturing, and activities related to renewable energy.

Additionally, environmental pressures can also affect the sectors that win from this transformation. Both socioeconomic conditions and climate change will affect the use of land and water in the Andean countries in the future, which means that competition for water between agriculture and the rest of the sectors is likely to increase. The growth of other economic activities and urbanization is what would most influence the future demand for land and water.

Under different scenarios of economic growth and increased productivity of the agricultural sector, it is observed that the demand for water in non-agricultural sectors grows faster than that of the agricultural sector in the countries of the Andean region. In turn, an increase in external demand through international trade will have an impact on land use in Colombia and Ecuador, while in Bolivia and Peru this impact will be due to an increase in local demand. The macroeconomic performance of the Andean countries is related to the international price cycle of primary goods prices.

The Andean Region averages low tax collection and depends on income derived from the exploitation of raw materials that are, at the same time, export items for the region. Central government revenues in 2023 were 27.3%, 31.1%, 36.9%, and 20.4% of GDP for Bolivia, Colombia, Ecuador and Peru, respectively, levels significantly lower than the OECD average and emerging economies in other regions. It will also be important to invest in innovation and the adoption of new technologies, since they could play an essential role in promoting competitiveness and productive diversification. This generates pressure on the gap

between savings and investment, both public and throughout the economy. In this sense, the search for a sustainable development model poses significant fiscal and external challenges for the region.

Under the current scenario, an immediate change in the energy matrix would make it difficult to accrue similar tax resources from activities associated with alternative energy sources. However, there are also opportunities from decarbonization. The correction of the climate course and the achievement of harmonized environmental policies would reduce the labor vulnerability of the Andean countries to adverse meteorological, hydrological, climatological, and biological results, and they could favorably affect real production.

Given this situation, choosing not to make decisions in the present on policies to address this situation could have consequences on the national income of the Andean countries. The pace and dynamics in the fulfillment of the commitments assumed by the countries in the world, in terms of decarbonization, will determine the speed at which the demand and price of fossil fuels will decrease. With the exception of Peru, which has a lower exposure to hydrocarbon activity, the rest of the Andean countries would have potential losses in terms of long-term GDP growth as a result of the reduction in carbon use. However, it is worth remembering that there might be potential compensation for its large deposits of metals critical to the energy transition, particularly lithium.

A key factor for any productive transition is the business environment and the region presents important gaps in this regard. Companies, on average, have low levels of productivity, are in the informal sector and have difficulties growing, something that is largely explained by regulatory issues that do not generate incentives for formalization and growth. On the other hand, there is little participation of the private sector in innovation and a lack of interaction with innovation systems, aside from the fact that access to credit is limited and mainly affects small and medium-sized businesses. Finally, the provision of public goods has also been insufficient and the relationship between job training and company demand is low and there are important infrastructure gaps.

It is important to highlight that not all are public sector issues. The management practices of companies in the region also show important gaps. At the sector level, it stands out that, despite this context, the agriculture sector has been victorious, but still faces challenges. In comparison with other sectors, the agricultural sector increased its participation in GDP in the Andean countries during the pandemic, even in spite of its significant challenges in terms of productivity.

Additionally, despite having a wide range of support institutions—public, private, linked entities, programs, and projects—in all Andean countries, the agricultural and livestock sector would benefit significantly from the strengthening of institutional mechanisms. It is also necessary to have a GVC vision to solve the region's export challenges, particularly considering the relative hesitancy regarding adopting technologies in the sector.

It should be added that the repositioning of the GVCs highlights the opportunities not seized by the Andean region. The region is poorly integrated into these chains and exports are biased towards supplies such as raw materials. As explained above, a series of episodes, such as the 2008-2009 crisis, the COVID-19 pandemic and, more recently, the Ukraine conflict have led to the reconfiguration of GVCs, which has led, in some cases, to multinational companies seeking greater security in the provision of supplies by purchasing them from companies that are geographically closer. Added to this is the search to reduce the carbon footprint that these global chains generate.

It should be noted that the region can greatly benefit from the GVC relocation process, also known as nearshoring. Since its peak in February 2016, China's share of total US imports has fallen approximately 6.3 percentage points, from which only Mexico and Canada have benefited so far. It is important to note

that of the 10 main beneficiaries of China's loss of market share in the United States, eight are outside the continent, which strongly points to the potential benefits that Latin America and particularly the Andean region can enjoy in the next years.

Based on the above, we can affirm that those in the Andean region are an example of countries that could benefit greatly from sustainable projects that would not only have a high social profitability but also a financial one, since given the decreasing costs of energy based on renewable sources, the net present value of carrying out and operating them would be high. However, low savings rates and high financial costs in the region act as a significant barrier.

The Impact of Green Financing: Quantitative Analysis for the Andean Region

Based on data from the World Bank, which has at least 34 macroeconomic variables since 1960 in terms of population, inflation, growth, debt, among others, a statistical model was built to measure investment capital flows to the Andean Region in function of population, economic and climate management variables for said region. In this sense, 3 upper-middle-income countries (Colombia, Ecuador and Peru) and one lower-middle-income (Bolivia) are taken in a panel data model for the period 1999-2022.

Panel data estimates take advantage of the information provided by cross-sectional variability, identifying and estimating the parameters of a response function by exploiting the information on the variation of the independent variables included in the model. If the variables do not show excessive temporal variability but do present transversal variability, the panel data approach would provide extra capacity for this estimation.

Looking at the corresponding correlations, GDP growth, renewable energy consumption, physical investment and official development subsidies have a positive and significant impact on the flow of capital investments to the region. On the other hand, it turned out that neither CO₂ emissions nor the interest rate were significant for investment flows. The latter draws attention and points to the fact that, given the high profitability of sustainable projects, the financial cost does not have an impact that hinders financing.

In this way, it can be concluded that the possibilities of receiving external financing resources depend on having an economy that is growing, that has local investment and that receives official aid for green energies. Likewise, it is noteworthy that it is demonstrated, with the model proposed in this document, that the countries that have had greater consumption of renewable energy received greater resources from abroad in their financial system, which have undoubtedly been used for clean energy projects.¹

National and Subnational Experiences in the Region

To get an idea of the scope and magnitude of the Andean regional vision regarding the issues described here on decarbonization, this section presents some experiences of regional and subnational programs. The programs described were important efforts to bring clean energy to the less developed areas of the region. These experiences serve as a reference for what has been done in the region to serve the most remote communities by agencies such as the Inter-American Institute for Cooperation on Agriculture (IICA) or the Energy and Environment Partnership (EEP) in the Andean Region.

¹ The details of the data, variables and estimates can be reviewed in detail in Annex A hereto.

Sustainable sources of energy in the communities of Guano and Pujilí (Ecuador)

Improved Stoves

Between 2012 and 2014, the project promoted the implementation of improved stoves in homes, whose design allows the efficient use of thermal energy, achieving savings in firewood consumption, as well as a considerable reduction in indoor smoke. This initiative offered a technological model for clean cooking through the implementation of improved stoves that reduce indoor smoke and firewood consumption up to a maximum of 98% and 60%, respectively. Built with local materials, these stoves have been validated in their technological, environmental and socio-cultural aspects.

Estimates suggest that this program led to a reduction in emissions of 876 tons of CO₂ per year, savings of 30 to 60% in firewood (2,170 kw/day) and a significant reduction in tree felling due to lower consumption of firewood for stoves. The unfinished 2-burner improved stove model cost \$188 dollars and received a total budget of \$151,000 dollars.

Bioclimatic Houses

Between 2012 and 2014, the project promoted the concept of healthy housing as an energy solution to achieve the efficient use of solar energy inside homes. This mechanism was implemented in order to mitigate the negative effects on the health of high Andean residents due to extreme temperature variations between day and night, which range between 25°C and -10°C, respectively, and the so-called “frosts” in the region (temperature drops throughout the day in the months of June, July and August).

The program yielded a total solar energy gain of 53 kWh/day, since 70% of thermal energy comes from a solar source. Likewise, it improved the thermal comfort of the homes, whose average daily temperature increased from 12°C to 15°C, while reducing the daily consumption of firewood per family from 10.3 kg to 7.8 kg. The complete 76m² housing model with technology-based climate construction, without finishes, cost \$9,816 dollars and had a total budget of \$198,000 dollars.

Greenhouse plastic sheeting, hot springs and solar panels contributing to the health of rural families

This proposal developed in 2013 and 2014 was aimed at promoting the concept of healthy housing with property design –incorporating the socio-productive dynamics of the rural environment– in order to improve living conditions through the use of renewable energy and energy efficiency. 60% of the benefited families had areas forested with native species and the total reduction in CO₂ emissions attributable to the program was 68 tons due to the use of improved stoves, hot chambers, solar lighting systems and the use of solar thermal baths.

Biodigesters and mixed hobs

Between 2013 and 2014, the use of clean energy was promoted, based on the use of biodigesters and mixed hobs, which reduced the combustion of firewood in the home, improving the health of families. Likewise, they help conserve forests by reducing the extraction of this resource. The model implemented made it possible to replace the use of firewood with biogas, which is a fuel that does not produce greenhouse gases in a mixed stove, and which can also be used as organic fertilizer to increase the productive performance of plants.

Electricity generation plants from urban solid waste

The project implemented between 2013 and 2015 promoted the design of solid waste treatment plants with biological mechanical treatment technology. Additionally, it promoted the creation of a financial tool to rate plant projects and the training of professionals in the use of solid waste with this type of technology. The budget for this program was \$186,000 dollars.

Renewable energy for schools and community centers in the Andean Paramo

The project, implemented between 2012 and 2014, promoted the installation of solar thermal collectors to provide hot water in schools and community centers, a community agro-industrial plant and a geriatric center in the Ecuadorean Andean paramo. The purpose of this initiative was to raise awareness on the use of renewable energy sources to spread health habits and practices aimed at improving the health and hygiene of local families. The program enabled the generation of the equivalent to 344.84 kwh/day of renewable energy and brought about a reduction of the emission of 21,306.6 tons of CO₂ per year. Thermal collectors without hydrosanitary installations were used for a unit cost of \$1,500 dollars and a total budget for this program was \$192,000 dollars.

Chilean planning experience

When analyzing the energy situation of the Andean Region and the perspective towards decarbonization of the area, it is worth taking into account the Chilean case, mainly due to its proximity and similar socio-economic characteristics to the region of our interest and its known strength in terms of planning. The Government of Chile published the long-term climate strategy for the country in 2019, highlighting the approach reviewed here: *Path to carbon neutrality and resilience no later than 2050*. The study raises the need for a multisectoral transformation that paves the way towards sustainable, emissions-neutral and climate-resilient development no later than the year 2050.

According to the work, the energy sector corresponds to the consumption of fossil fuels at the national level, which reaches 77% of the total national emissions, having increased its emissions in 2018 by 159% since 1990 and by 1% since 2016, respectively. These data correspond to the behavior of the country's energy consumption, including the consumption of fossil fuel (mineral coal, diesel and natural gas) mainly for electricity generation and the consumption of liquid fossil fuel (mostly diesel and gasoline) for land transportation. Since 2016, there has been some stabilization of emissions in this sector due to natural gas plants, which since 2010 have been responsible for approximately 25% of electricity generation. Additionally, there have been new renewable energy sources, highlighting the participation of wind and solar sources, which have grown together by 73% since 2016, generating 17.8% of the electricity, all of which has replaced the electricity generated by coal.

The guidelines, objectives and long-term goals regarding climate change will be achieved in Chile through various execution instruments, which will contain concrete actions and measures on mitigation and adaptation to climate change and related to the means of implementation, such as:

- » **Sectoral Mitigation Plans:** To establish a set of actions and measures to reduce or absorb GHG and not exceed the sectoral emissions budget, ensuring compliance with the objectives and goals set by each sector.

- » **Sectoral Adaptation Plans:** To establish a set of actions and measures that ensure the implementation of the objectives and goals set by each sector, to adapt those sectors with greater vulnerability to climate change.
- » **Climate Change Regional and Communal Action Plans:** Prepared by the Regional Committees for Climate Change (CORECC) and the Municipalities, respectively, and whose purpose will be to consolidate the actions of the Sectoral Plans that will be implemented in the territory and also define the additional actions that are developed from the same region and that have regional financing.

3. Review of International Financial Markets to Determine the Scope and Impact of Existing Instruments for Transitioning Towards Decarbonization in Developing Countries

General Framework Of Decarbonization Experiences

According to various estimates, countries are estimated to have to invest around 4.5% of their GDP to achieve the infrastructure-related Sustainable Development Goals (SDGs) and stay on track to limit global temperature rise to no more than 2 degrees Celsius. Studies conducted by the International Energy Agency indicate that this investment is currently around 2.5% of GDP, it should reach the aforementioned 4.5% by 2030 and return to levels of 2.5% in 2050.

However, the current level of all climate-related development finance (from bilateral sources, multi-lateral development banks and development financial institutions) is below projected needs. The recent \$93 billion replenishment of resources by the International Development Association, the World Bank's fund for the poorest countries around the world, will provide some of the required support. Middle-income countries, with limited access to concessional funding or sufficient donor funding, must also urgently implement key interventions, particularly in the areas of energy and transport decarbonization and new technologies.

The analyses conducted by the World Bank assertively state that it is essential to develop financeable, climate-smart projects and mobilize private capital in an affordable manner. Scarce public funding can be channeled to the areas most in need, while private capital – along with the efficiencies it can bring – takes its rightful role, driving economies and growth.

Despite the clear case for private capital, according to the Infrastructure Monitor 2021, recently published by the World Infrastructure Centre, around three-quarters of global private investment in infrastructure occurs in high-income countries. Developing countries attract only a quarter of global investment. Furthermore, two thirds of investments in developing countries are concentrated in just five countries.

Regarding private investments, in chapter 3 of the Global Financial Stability Report (GFSR), published by the International Monetary Fund in October 2023, there is an analysis of the investment funds dedicated to the subject. A brief extract of the results is presented in Box 3.1.

Box 3.1 International Funds for Sustainability

The International Monetary Fund conducted an analysis with information from Morningstar, finding a sample of 36,587 funds that manage assets worth more than one hundred million dollars, in the period 2010-2023. In this sample they found that approximately 3,357 funds are classified under the ESG (Environmental, Social and Governance) category, 554 funds are classified as sustainable-themed and 349 as climate action funds.

At the end of 2022, the total asset value of conventional funds amounted to \$42,600 billion, while ESG funds had an asset value of \$2,400 billion, sustainable-themed funds were worth \$137.8 billion, and of climate action funds were worth 226.2 billion dollars.

As a reference, the International Monetary Fund indicates that a possible scenario would amount to 5.000 billion dollars annually by 2030, of which it is estimated that 80% would need to be covered by private investment and could reach up to 90%.

The path to financing the transition to a low-carbon model in developing economies is complicated by lower credit capacity, the nascent state of many sectors, weak implementation capacity, a lack of bankable projects and issues related to affordability and debt sustainability. Once again, developing countries lack the financial vehicles to execute projects with high financial profitability and that enjoy high rates of return. The countries that suffer the most from climate change are developing countries, given that, when it comes to mitigating the disasters caused by said change, they must allocate their scarce resources towards such purposes, which tends to postpone or reduce the costs. income from other programs. Therefore, it is of the greatest importance to continue with tools that have proven useful in the matter, such as the widely known Kyoto Protocol.

The Kyoto Protocol

The Kyoto Protocol makes it possible to perform transactions with third parties, with the ultimate goal of complying with the obligations agreed upon within it, helping to improve the profitability of projects in developing countries. In the same Protocol it is considered that when a country, which is obliged to comply with the reduction goals assumed in the commitment, cannot execute them on its own, will have the opportunity to resort to one of the three flexibilization mechanisms.

The Kyoto Protocol includes three mechanisms that allow to increase climate change mitigation:

- 1. Joint Implementation:** Through which participants will be able to transfer or acquire Emission Reduction Units (ERUs), which result from projects aimed at reducing polluting greenhouse gas emissions in order to comply with the obligations established within the Protocol.
- 2. Clean Development Mechanisms (CDM):** Within which countries with the highest emissions of polluting gases will be able to acquire Certified Emission Reductions (CERs) or Removal Units (RMUs) resulting from projects generated mostly by developing countries.
- 3. Emissions Trading:** These are emissions trading activities (Allowances or AAUs) between parties granted in accordance with emissions reduction goals.

The aforementioned instruments are colloquially known as “carbon credits” and are quantified in tons of carbon dioxide. The proposal for a marketing system for these bonds includes the purchase and sale of certified emission reductions (CERs), emission rights (AAUs), or ERUs. The commercial appeal of these instruments lies in the fact that, since the polluting gases are distributed homogeneously and globally in the atmosphere, it will not matter where the decontamination is carried out.

For example, a project aimed at reducing GHG emissions, such as carbon dioxide absorption projects through forestry systems, would first calculate the emissions reduction that the project will tend to produce. Once the estimate has been made and accredited by the executive board of the protocol, said emissions will be sold to a buyer, who tends to be a private company from an industrialized country. Thus, the magnitude of emissions will be established, as well as prices, among other things. Once the project is carried out and this transaction system is implemented, the amount of carbon captured by the forest will be verified and quantified.

Current models and financial controls allow companies to invest in projects to reduce GHG emissions in developing countries. Therefore, through carbon credits, companies will be able to count these reductions in their countries of origin as their own or trade them in emissions markets. Any operation of this type will be supplementary to the national measures adopted to meet the quantified commitments to limit and reduce emissions.

According to the Kyoto Protocol, it is crucial to account for afforestation, reforestation and deforestation activities at the national level. Likewise, industrialized countries have the option to account for the management of revegetation lands, forests, crops and pastures; therefore, developing countries are eligible for afforestation and reforestation activities, with the purpose of creating projects aimed at the preservation or regeneration of their forest systems for the capture of CO₂, in order to trade that capture with industrialized countries through green bonds.

For this reason, countries that have forest areas have begun to measure, in metric tons, the amount of carbon that their forests could capture. Such carbon absorption capacity is translated into Certified Tradable Offsets (CTOS) or green bonds. Although the largest polluting emitter, that being the United States, has not ratified the Kyoto Protocol, a new global carbon market has emerged, since it is expected that in the future there will be more restrictions on polluting. According to World Bank research, there is no single carbon market, defined by a product, a single type of contract or a single system of buyers and sellers. In a broad sense, the “carbon market” is a set of transactions where amounts of greenhouse gas emissions reductions are exchanged.

There are few international entities that have tried to develop the carbon market proposed by the Kyoto Protocol, the most important being the World Bank initiative: the *Prototype Carbon Fund*. The funds managed by the World Bank seek to consolidate the carbon market. The capacity building component in World Bank funds has been instrumental in consolidating the global carbon market.

Carbon Market Instrumentation

The ultimate goal of the market is to estimate future reductions in carbon emissions or the equivalent. There are two main emissions in this market: Certified (CERs) and Verified (VERs). The form of commercialization in the carbon market is established as in any other, that is, there is a transferable good that can be negotiated between a supplier and a demander by agreeing on a fixed value of such good for each party. The good to be marketed in this market is the sale of emission reductions which can be CERs or VERs, which translate into a ton of CO₂. In turn, Certified Emission Reductions (CERs) are the so-called green bonds that are awarded for undertaking projects that aim to capture carbon dioxide.

Emission rights trading market

There are four active markets for GHG emissions rights: the European Union Emissions Trading System, the United Kingdom Emissions Trading Scheme, the New South Wales GHG Reduction Scheme and the Chicago Climate Exchange. Approximately 90% of the traded volume consists of emission rights corresponding to the year 2005, while approximately 6% would correspond to 2006 and 4% to 2007. The largest of the four markets mentioned above is the European Union Emissions Trading System. Emission rights are homogeneous assets, and the purchase contracts are also similar in that case. Consequently, the price range corresponding to European Union emission rights is small, allowing a market price for them.

Trading in Emission Allowances Project-Based Transactions

These are transactions where the buyer acquires CERs from a project that produces quantifiable GHG reductions compared to a no-project scenario. Some studies indicate that the project-based emissions reduction market is growing significantly. On the other hand, new buyers of emissions reductions emerged, namely, private and public entities in Europe, who now account for 60% of the volume of emissions reductions purchased through project-based transactions, compared to 21% for private and public entities in Japan and 4% for private companies in Canada. The offer of emissions reductions has remained strongly concentrated in a small number of countries, particularly India, Brazil and Chile.

Energy Finance Alternatives for the Andean Region

According to Cisneros, et al. (2021), the involvement of the private sector in the climate agenda allows for financing alternatives and diversification of the investment portfolio. The intention is to ensure social inclusion and define long-term sustainable projects that lead to sustainable development. As a complement to international funds for climate change, the private sector has contributed 56% of the resources of the total programs and projects, reaching 326 billion dollars in 2017-2018.

The private sector as a means of financing climate projects can be involved in different ways: a) During the planning process with incentive schemes for its entry, b) with an exchange of positive experiences, providing technical assistance or c) by defining common objectives with the authorities. When economies have gaps in financing projects associated with climate issues, private funds are often a good alternative for mobilizing resources to bring together public-private interests for local development.

In Latin America, governments are providing facilities for attracting private capital, defining participation schemes and establishing communication channels between the various actors. Colombia is a good example, where the *Climate Action Enhancing Package* (CAEP) has been used to enhance the participation of the private sector in aspects such as planning or determining key commitments of economic and social policy.

According to analyses prepared by the *Center for Clean Air Policy* (CCAP), a private international institution that is dedicated to aspects of climate change, Latin American countries have many opportunities to reduce carbon emissions in multiple sectors, such as energy, transportation, agriculture and industry, with abundant clean energy resources. Energy (46%) and agriculture (23%) account for the majority of greenhouse gas emissions in Latin America and the Caribbean. Furthermore, achieving a carbon-neutral region seems plausible with nature-based solutions, such as carbon sinks and biodiversity conservation (Latin America and the Caribbean represent 50% of global biodiversity).

In fact, the region has already made greater efforts to reduce greenhouse gas emissions and chart a path toward net zero levels. However, some challenges related to macroeconomic, financial and institutional risks hinder the implementation process and a higher level of commitment from all sectors. To overcome these urgent challenges and achieve national climate goals, collective action from the public and private sectors, including financial and non-financial actors, access to climate finance, and innovative solutions in line with national climate priorities, will be crucial.

To date, the public sector, multilateral institutions, and bilateral bodies play a crucial role in providing the necessary financing and enabling green investments by establishing norms and standards for financing options. Given the increased scale of finance needed to achieve climate goals, more efforts are essential to unlock climate finance flows and access to more innovative financing solutions. These efforts include reducing the risk associated with green investments and making them more bankable, while removing barriers in financial markets.

Emphasizing the importance of avoiding financing of illicit origin is a special issue all on its own, for which it is necessary to reconstruct an institutional framework on the subject, as illustrated in Box 3.2.

Box 3.2 Venezuela's experience

In June 2012, Venezuela implemented the *Plan de la Patria* 2013-2019, which addressed the problem of the use of traditional energies. Objective 5.4.3 of the Plan established the design of a national adaptation plan for climate impact scenarios. However, more than a decade after the implementation of the Plan, the results are not as expected.

According to the 2021 World Economic Forum Energy Transition Index, Venezuela was ranked 111th out of 115 countries analyzed in terms of adoption of clean energy, since, among other factors, less than 1% of its electricity consumption comes from solar or wind energy sources, despite the official intention of searching for renewable energy sources.

A crucial aspect in the implementation of clean energy projects refers to the provisions of national and subnational authorities, not only in strategic documents, but also in direct involvement with public and private organizations with the same objective. The most recent analyses agree on at least three aspects: (a) the low-carbon economy is now more feasible and many governments and regulatory bodies have begun to show their support; (b) governments that have followed this path begin to gain political capital by promoting public policies that consider climate change; and (c) instead of thinking about how to dispose of their waste, many companies are beginning to consider carbon emissions as part of their production and something they can trade with.

Perhaps a basic aspect that Venezuela should take into account is that which refers to local regulations with measures to stop financing for money laundering (AML) and terrorism. The Basel AML index, which considers 16 indicators (corruption, financial standards, etc.), has increased in Venezuela, going from 6.51 in 2015 to 6.56 in 2020 and 7.63 in 2023. In addition to this, in March 2023 the Financial Action Task Force (FATF) and the local government published a joint report on measures to combat the financing of money laundering and terrorism. The report considers compliance with 40 FATF recommendations on this matter. In the 2023 evaluation of Venezuela, 4 of these recommendations were not fulfilled (financial sanctions for capital diversions; transparency), 26 were partially fulfilled and only 10 measures were fulfilled.

The country's most recent initiative in terms of the search for renewable energy sources is the creation of the Venezuelan Chamber of Renewable Energy (CAVENER) in November 2023, with the intention of promoting the development of initiatives related to the use of clean energy and energy efficiency. This effort is led by the Institute of Higher Administration Studies (IESA) and proposes establishing links with other institutions and the private initiative.

On the other hand, according to the study by Cabral (2014) from ECLAC, Sources of Financing for Climate Change, the World Bank estimates that the damage caused by extreme climate events amounts to 148 billion dollars a year, well above the 37 billion estimated in the eighties, while international funds to address these damages are only estimated at a little less than 50% of that estimate. To this value, we must add the costs of water scarcity, the change in agricultural patterns, the alteration and depletion of fishing resources, damage to the health of the population and the irrecoverable loss of biodiversity, among many other costs. Faced with these phenomena, which not only represent a high cost for humanity, but many of them have devastating and irrecoverable effects, there are relatively fewer resources to mitigate them or, where appropriate, eradicate them from some regions on the planet.

In 2009, during COP15 in Copenhagen, developed countries established a commitment to allocate 100 billion dollars starting in 2020, which is clearly insufficient compared to the estimates indicated. Although these resources originally consisted of a combination of public and private money, currently the majority of resources allocated by developed countries to developing countries for climate change are public resources.

Additionally, according to figures from the *Overseas Development Institute* and the Heinrich Böll Stiftung foundation presented on the *Climate Funds Update* website, the total amount of resources pledged by all countries to multilateral and bilateral funds amounts to \$35 billion from 1994 to date. This is a lower figure compared to the climate damage costs listed here. Most of this amount has been contributed since 2005, when the Kyoto protocol came into force.

Developing countries, such as those that comprise the Andean Region, by accepting the implementation of a new global Measurement, Verification and Reporting (MVR) system of adaptation and mitigation actions carried out with international financing, would have access to resources additional to those allocated through international funds, in the form of grants or concessional loans. This is just one step in the structuring of international financial models to confront climate change.

Cabral's study describes up to 23 different funds to combat climate change, which include: multilateral, private, bilateral, national, and even European Union Funds. The most important ones are listed below, with the amounts of financing granted. Without a doubt, the number of funds and their resources have grown to date and their scope has diversified. Some of the most relevant funds in the analysis are the following:

- » Japan: Fast Start Financing – Bilateral Fund – \$15 billion
- » UK International Climate Fund – Bilateral Fund – \$4.64 billion
- » Norway: International Climate and Forest Initiative – Bilateral Fund – \$1.61 billion
- » Pilot Program for Climate Resilience – Multilateral Fund – \$1.16 billion
- » Germany: International Climate Initiative – Bilateral Fund – \$1.09 billion
- » Global Environment Facility – Trust Fund (GEF 5) – Multilateral Fund – \$1.08 billion
- » Amazonas Fund – Private Fund – \$1.03 billion

The financial mechanism is contemplated in the climate change conventions, in which the creation of the Green Climate Fund (GCF28) was proposed and approved. However, since 1994, the Global Environment Facility (GEF) has been the most widely used international financial mechanism, created primarily to provide grants, although it also occasionally makes concessional loans to developing countries so that they can meet their commitments in the conventions signed at the Rio Summit. Its resources are allocated to carrying out environmental protection projects and are only granted to cover the additional costs of the projects. An essential criterion of GEF resources since its inception is that it only finances projects that have a demonstrative nature, which is why it does not grant resources for projects that have already been financed. The Fund Council is made up of 32 constituencies, 16 of them comprised by developing countries, grouped by region, 14 formed by donor countries and two by economies in transition.

On the other hand, a very active organization in promoting productive projects with an emphasis on clean energy has been the French Development Agency (AFD Group). The AFD has a mandate in countries that are eligible for public development aid (according to the list of the Development Assistance Committee) where it intervenes thanks to an authorization from the Interministerial Committee for International Cooperation

and Development (CICID): Bolivia, Colombia, Ecuador and Peru.² According to the Strategic Orientation Plan, prepared by the AFD group, there are six transitions that the Andean Region needs to comply with the UN Agenda 2030 and they are listed below:

1. Territorial and ecological transition, in the face of the challenges of environmental protection and the fight against climate change, which risk taking a backseat to short-term emergencies.
2. Demographic and social transition, to reduce inequalities and improve access to quality social services, profound affected by the crisis.
3. Economic and financial transition, to promote inclusive financing, for example with less emissive and more sustainable development models.
4. Political and citizen transition, towards more horizontal, inclusive and participatory measures.
5. Energy transition, which must be oriented based on the Paris Agreement and the inevitable evolution of the countries' energy matrices
6. Digital and technological transition, which must contribute to the transparency of governance, in a context where the pandemic revealed the resilient virtue of digital transformation, particularly for distance education.

The AFD group has proposed that, beyond the projects that are usually financed in each country of the Andean Region, it is necessary to define innovative and multisectoral actions, with the participation of different French agencies. The above is done in close collaboration with the local population and creating synergies with national and subnational authorities. Some of these actions refer to aspects such as:

- » Development of electric mobility, in a geographic area broader than the Andean region and through alliances with multiple financial institutions.
- » Integrated management of water resources, particularly when they cross borders.
- » Innovative financing of territorial entities, considering that Andean cities constitute true laboratories in terms of sustainable development and participatory democracy.
- » Protection of the Amazon and support for indigenous peoples, in line with the Alliance for the Preservation of Tropical Forests.
- » Consolidation of regional energy integration, to promote renewable energies and develop green energy exports.

² For these purposes, see <https://www.afd.fr/fr>.

- » Support for a decarbonized Andean economy in 2050, based on macroeconomic modeling, research projects and technical advice.

According to Arrázola (2021), from an administrative law perspective, there are various alternative mechanisms for financing primary sector projects, mainly regarding mining. The document provides a detailed analysis of traditional financing mechanisms for mining projects and proposes alternative financing mechanisms. This review and analysis not only focus on the legal aspects of the financing instruments but also link them with the interaction of the different members of society. The document analyzes six traditional mining financing mechanisms: corporate loans, project finance, venture capital, debt financing, capital financing (initial public offerings), and private placements.

The document also explores three alternative mechanisms for financing mining projects, with a subdivision of four alternatives for the second mechanism. These mechanisms include private equity, production-based financing (subdivided into supply contracts, advance payment contracts, royalty contracts, and streaming contracts), and crowdfunding.

Regarding the Private Equity mechanism, it is convenient for the purposes of this document to review the details. This investment may come from different sources such as private equity funds, family businesses, hedge funds, strategic investors, sovereign wealth funds, among others. Among strategic investors we can find large mining companies, mineral traders, refiners, end users and even state-owned companies. In the case of sovereign capital funds, they look for mining projects that are already in the production stage, or at least close to it, focusing particularly on the project being large-scale mining.

Private capital funds also seek to ensure that the mining project is in production, close to it, or at least with certainty of the start of its operation. The above is to avoid having to run the risk of the mining project never entering the production phase. There are several advantages in case private equity funds are used to finance mining projects, for example, if the investor is specialized and willing to take risks (e.g. family businesses), it is possible for the mining company to find an investor who is willing to inject capital from the earliest stages of the project, since he is interested in the profits that the project can generate in the long term.

On the other hand, strategic investors, having very specialized knowledge of the mining market, may also be interested in investing in the project from its early stages, since this knowledge brings with it added value, especially with respect to the demand and supply of the market. In general, private capital investors will be able to make direct investments, which is quite beneficial for both the company and the project since funds are immediately available.

Colombia's Green Protocol

An example of public policy with financing focused on clean energy is Colombia's Green Protocol. The main components of this program are described here, which highlights the coordination between federal authorities, financial institutions and society in general. More details about this program can be reviewed in the documents of the Presidential Agency for International Cooperation of Colombia (APC Colombia). The Green Protocol is an agreement between the Colombian national government and the financial sector that seeks to promote the sustainable development of the country and to work for environmental preservation and the sustainable use of natural resources. The Protocol defines four strategies:

1. Develop green products and services. Promote the financing of sustainable development through credit and/or investment facilities, as well as programs that promote the sustainable use of natural resources.

2. Incorporate social and environmental impacts in the credit and investment risk analysis of the activities and projects that will be financed, complying with environmental regulations.
3. Promote eco-efficiency and sustainable consumption of renewable natural resources.
4. Communicate the Protocol through its dissemination channels, inform and involve interested parties about the policies and practices of the institutions associated with the protocol.

The protocol has resulted in tax incentives for banking sector clients who invest in climate change mitigation and adaptation projects, the development of an Environmental and Social Risk Analysis (ARAS) Guide, and improvements in eco-efficiency. With the support of the Ministry of Environment and Sustainable Development (MADS), the Sustainable Purchasing Management Guide was developed for financial entities, and a carbon footprint measurement standard was also established, validated by the Colombian Institute of Technical Standards (ICONTEC).

The success of the implementation of the Protocol since 2012 is due to effective communication between the entities and committees, the supervision of the federal government and the commitment of the senior management of the participating organizations (the Protocol was established with the participation of more than 20 national and international entities). The original Protocol signed in 2012 was ratified for another five-year period in 2017 with the commitment of 22 financial entities.

4. Mexican Financial Instruments as a Financing Alternative

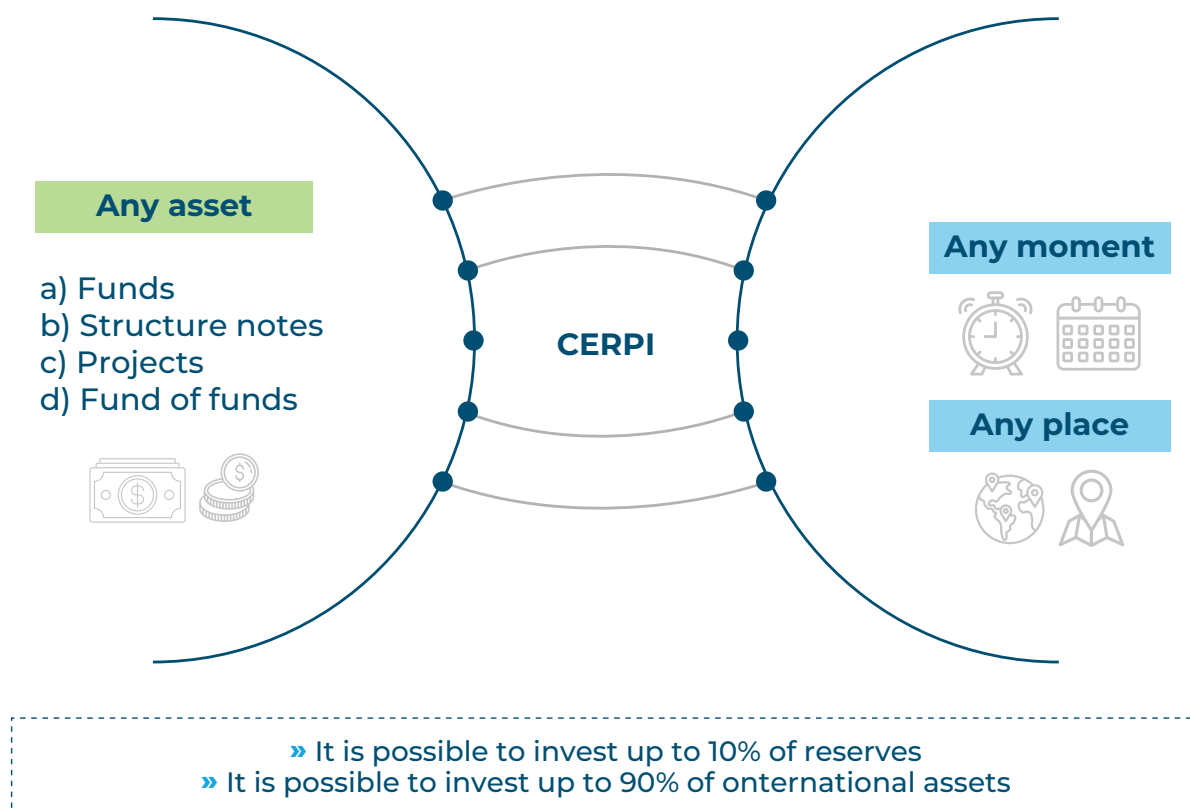
In Mexico, there are various financial vehicles that can be used to consolidate private resources and their subsequent application to projects with a focus on decarbonization. As an example of these instruments, we can consider examples such as CKDs (Certificates of Development Capital) and CERPIs (Fiduciary Stock Certificates for Investment Projects).

According to the definition of the Mexican Stock Exchange (BMV), CKDs are stock securities, which represent negotiable securities within the Stock Exchange, intended for the financing of productive projects in Mexico. CKDs allow to obtain investment resources for sectors and activities that have a high potential for long-term growth. CKDs emerged in 2009, as an alternative for Investment Companies Specialized in Retirement Funds (SIEFORES), entities whose objective is the investment of the resources of Retirement Funds (AFORES). Since their creation, CKDs have been used for investments in projects in sectors such as telecommunications, energy or hydraulics. CKDs are regulated and supervised by the National Banking and Securities Commission (CNBV) and the Mexican Stock Exchange.

For their part, CERPIs are known as structured investment instruments, and are made up of resources obtained by a company to finance its projects. They emerged in 2015, through inclusion in the general provisions applicable to Securities Issuers and other participants in the Securities Market. This instrument is placed through a public offering through the Mexican Stock Exchange. This public offer is restricted to institutional investors or those who have investments in securities for a minimum amount of 20 million investment units, and they can invest up to 90% of their capital abroad.

The main characteristics of CERPIs are as follows: Investment decisions can be made freely by the Administrator; unlike CKDs, the Committee does not have the non-delegable power to approve investments and divestments. The Technical Committee has several powers, including monitoring compliance with the rules of the Trust, verifying the Administrator's compliance, and reviewing the Administrator's quarterly report. The Assembly of Certificate Holders has the functions of approving issuance expansions, removing the Administrator if required, approving the Administrator's commissions, and modifying the purposes of the Trust or terminating it if applicable. To appoint representatives to the Technical Committee, 25% of the CERPIs in circulation is required, whereas CKDs require 10%.

Some examples of initial CERPI issuances include: GD Structure for 1.45 billion pesos, MIRA Manager for 800 million pesos, México Infrastructure Partners América Latina for 600 million pesos, and Black-Rock México Infraestructura for 526 million pesos.

Figure 2. Operation of CERPIs

An important aspect to consider for CERPIs is the possibility of participation by Investment Companies Specialized in Retirement Funds (SIEFORES), with which resources from retirement funds in Mexico can be invested in trust certificates of investment projects. As of 2018, SIEFORES were allowed to invest abroad through CERPIs, up to 20% of their structure.

Additionally, regarding the particular operation of the CKDs and CERPIs in Mexico, the analysis of the Environmental, Social and Governance (ESG) factors stands out and can be found in the different promotional documents of these instruments by the Mexican Stock Exchange.

According to this analysis, ESG factors must be recognized and applied in the business models of organizations and investments, as indicators that add value to economic performance in order to encourage investment in companies and projects that promote the incorporation of ESG criteria in making decisions about asset management, ensuring that they consider broader objectives in the development of society, as well as impact investments.

According to the information published by the Mexican Stock Exchange, CKDs or CERPIs that intend to list new securities or recognize those previously listed under the ESG Funds or Impact Funds category must comply, at a minimum, with the following requirements:

ESG Funds (labelled in the series with “A”):

Fiduciary institutions that intend to list new securities or recognize securities previously listed under the ESG category must comply with the following:

1. Adhesion, membership or subscription to collective reporting or compliance organizations on ESG matters; the Administrators must be signatories or members and participate annually in the evaluation or qualification of at least one recognized international reporting organization or service.
2. Include in the Placement Prospectus or Sustainability Report, website and annexes at least the following Policies, Codes and Manuals.
3. When the Administrator makes investments in the Promoted Companies and/or projects, it must be established that the Promoted Companies and/or projects ensure ESG commitments, and the Administrator must report compliance in the Annual Sustainability Report.

Impact Funds (Labelled in the series with “I”):

Fiduciary institutions that intend to list new securities or recognize securities previously listed under the Impact category, must comply with the requirements of the ESG Funds, indicated in points 1 and 2 above, and include them in the Placement Memorandum or Sustainability Report, website, and annexes. Additionally, they must submit a certification or opinion issued by an independent third party that certifies that the destination of the resources will be directed towards green, social, or sustainable projects in the eligible sectors, in accordance with the following:

- I. **Green Impact Funds:** capital development certificates or investment project certificates (CKDs or CER-PIs) in which the destination of the resources is applied exclusively to projects related to renewable energy, sustainable construction, energy efficiency, clean transportation, water, waste management, agriculture, bioenergy, afforestation, among other related activities.
- II. **Social Impact Funds:** capital development certificates or investment project certificates (CKDs or CER-PIs) in which the destination of the resources is applied exclusively to projects related to activities aimed at supporting specific community causes and/or for the benefit of some group or sector of society.
- III. **Sustainable Impact Funds:** capital development certificates or investment project certificates (CKDs or CER-PIs) in which the destination of the resources is applied exclusively to a combination of projects that includes the performance of activities described in sections I and II above.

For both Funds, ESG (A) and Impact (I):

In order to maintain the label in ESG or Impact Funds, fiduciary institutions must annually publish to the Stock Exchange an Annual Sustainability Report audited with the following conditions:

- I. It must be submitted no later than May 31 of each year (the year after the label was obtained).
- II. It must be prepared based on the following criteria: a) *Global Reporting Initiative* (GRI) contained in the current manual published on its website, b) *International Sustainability Standards Board* (ISSB)
- III. Include, at a minimum:
 - a) Opinion of the external auditor regarding the veracity of the information contained in the report;
 - b) Adherence to the criteria of the responsible investment policy and an improvement plan to adhere to said criteria;
 - c) Carbon footprint measurement report, regarding those investments that comprise the portfolio;
 - d) For ESG Funds, starting from the first year, the result of the evaluation of ESG standards or equivalent, depending on the type of organization or company chosen;
 - d) For Impact Funds, the opinion of an independent third party that certifies the use of resources on investment projects, which must be updated annually.

On the other hand, in an analysis of hybrid instruments and their financing potential for green projects in Mexico, the British Government Program UK PACT describes various financial instruments that should be taken into account to promote productive clean energy projects. This analysis presents a series of advantages and challenges for CKDs, which are presented below.

Advantages of CKDs:

- » Access to a new investor market: for the issuer, the creation of a CKD implies access to a new investor market, the SIEFORES.
- » Higher returns than instruments listed on the market: CKDs give investors the opportunity to obtain returns higher than more traditional equity and debt instruments listed on the market.
- » Corporate Transparency: CKDs have strong corporate governance based on applicable regulation as well as industry standards.
- » Tax transparency of the issuing trust: this is generated through passive income management trusts or private equity investment trusts.

Challenges for CKDs

- » High associated costs: Investors with investment mandates other than SIEFORES could be limited from investing due to the high costs associated with such instruments.
- » Heavily regulated: For the issuer, there is an extra regulatory burden due to regulatory compliance with certain legal and fiscal requirements.
- » Less control by the issuer: The issuance of a CKD takes away control from the issuer since it involves involving investors in making investment decisions.

Likewise, the analysis highlights that CKDs and CERPIs have important areas of opportunity for investments. It is said that the adaptation of the green offer in this type of hybrid instrument is relatively simple if it is born with a green investment mandate. The structure of the CKDs and CERPIs allows investment in infrastructure projects in early stages of development and can be labeled as green as long as they generate positive environmental impacts and belong to eligible sectors such as: renewable energy, water, waste, clean transportation, sustainable forest management, among others.

In this sense, UK Pact considers that CKDs can also be defined as green when the underlying cash flows relate to low-carbon assets or when the income is used to invest in assets with environmental benefits. The green underlying collateral pool would typically include financial assets such as mortgages on buildings certified under LEED, Energy Star, or other building labels; mortgage financing for energy efficiency improvements; loans or leases of electric and hybrid vehicles; loans or leases on solar or wind assets; loans for energy efficiency improvements; and loans to small and medium-sized green companies.

Traditional Instruments

In addition to the advantages offered by CKDs or CERPIs as mechanisms to attract investment flows towards decarbonization projects, there are options within the traditional financing market that are used in the country, both in bank credit and in the issuance of debt.

An example of green funds in Mexico is presented in Box 4.1: HSBC funds. As can be seen, the possibility of presenting an alternative energy project to be supported by a Fund of this type is very interesting to the extent that: a) its scope is correctly defined and b) it is being timely monitored.

Box 4.1 HSBC Green Funds

HSBC Funds are based on the widespread idea that green bonds have a high impact as they are sustainable investments to finance projects that are aligned with the Sustainable Development Goals (SDGs) promoted in the United Nations 2030 Agenda and will also help promote the development of economies in the post-COVID-19 stage. By 2030, the issuance of green bonds will contribute to investment opportunities that will bring the creation of new jobs and positive effects for the environment.

Green Bonds will allow obtaining capital and investment in new and existing projects with environmental benefits. Green Bonds are similar to a traditional corporate bond and, if possible, should follow the Green Bond Principles (GBP). The GBP are voluntary guidelines that recommend transparency and disclosure, promote integrity in the development of the Green Bond market by clarifying the approach to issuance of a green bond.

HSBC states that to meet the requirements of the Green Bond Principles, interested parties must address the following four areas, and disclose them in a public document in relation to the Green Bond Guidelines: Framework: Create comprehensive guidelines for Green Bonds aligned to the Green Bond Principles; Review: Obtain an independent external opinion for the Green Bond guidelines; Launch: Market and execute the transaction; Reports: Report annually on the use of resources and impact of the bonus.

Eligible project sectors include:

Renewable energy; including storage and smart networking; green buildings; pollution prevention and control including the reduction of atmospheric emissions and control of greenhouse gases; eco-efficient products; clean transportation; sustainable management of living and natural resources and land resources; energy efficiency; conservation of terrestrial and aquatic biodiversity.

Another alternative proposed by HSBC is Green Credits. These Green Credits are available for the financing or refinancing, in whole or in part, of new or existing eligible Green Projects. Green credits are similar to traditional corporate loans but must follow the Green Loan Principles (GLP), which were launched by the Loan Market Association in March 2018. They are closely aligned with the Principles of Green Bonds.

Eligible project sectors include: Renewable energy; including storage and smart networking; Green buildings; Pollution prevention and control including the reduction of atmospheric emissions and control of greenhouse gases; eco-efficient products; clean transportation; sustainable management of living and natural resources and land resources; energy efficiency; conservation of terrestrial and aquatic biodiversity.

HSBC has set a global goal of providing between \$750 billion and \$1 trillion in financing between 2020 and 2030. HSBC also aims to achieve net zero carbon emissions in its operations and supply chain by 2030, or even before, if possible.

Regarding stock financing, there are already examples in Mexico that are carried out at the subnational level, such as the Social and Sustainable Bond of the State of Mexico (see Box 4.2). In this sense, it is of the greatest importance to decentralize the efforts made in this area, in order to multiply the management to obtain resources that support the decarbonization process through a greater geographical scope.

Box 4.2 Sustainable and Social Bond of the State of Mexico

The state of Mexico, the state with the largest population in the country, with 16.99 million inhabitants in 2020, was the first federal entity in Mexico to place a Green Bond in the Mexican stock market on September 29, 2022. The bond with social and sustainable characteristics, meets the Sustainable Development Goals of the UN Agenda 2030, established in the 2017-2023 State Development Plan.

With Green Bonds, the state of Mexico allocated 2,890 million pesos to finance 18 social, sustainable, and green projects. Of this total, 1,690 million pesos will be allocated for state projects (mobility, urban and social development, “Ciudad Mujer” in the municipalities of La Paz and San Mateo Atenco) and 1,200 million in works in coordination with the Government of Mexico: Mexibus I, Trolleybus Chalco – Santa Martha and Mexicable Ecatepec – Tlalnepantla.

5. Conclusion

Throughout this document, we have presented various problems associated with conventional energies. The international agenda has advanced at an important pace and has been accompanied by public and private funds and financial instruments that allow the triggering of positive aspects that reverse the global climate trend. Additionally, as analyzed in detail in this document, it will become increasingly more expensive to rely on traditional energy while, conversely, the cost of renewable energy has been decreasing in recent years. However, access to credit to install and operate highly profitable projects remains an obstacle.

Therefore, it is important to emphasize some aspects of public policy and coordination with society and financial institutions to achieve decarbonization in the Andean Region. This includes promoting productive projects that increase the added value of sectors such as agriculture and that have a positive impact on the well-being of the population. The topic is broad and has different aspects, so here we point out only some aspects to take into account to follow the path outlined towards communities that are environmentally cleaner and more economically prosperous. Both the 2030 Agenda and the Kyoto agreements are very specific in terms of their scope, the defined times for the proposed climate changes, and the roles of each of the participants in society, all in the search for a common good, which is clean energy.

Although it is true that the sectors linked to oil and coal production are very large in the Andean Region, both in terms of employed personnel and in their regional and population spectrum, it is essential that the region continues to enhance efforts, some hitherto isolated, in terms of alternative energies. As experience tells us, there are multiple examples of both developed and developing countries that have opted for energy diversification. A starting point that is unequivocal for any public or private initiative is the existence of minimum infrastructure that serves as a basis for incoming capital to generate an impact in the most relevant sectors and for its efforts to translate into better jobs, higher incomes and greater well-being for the Andean population.

It is also important to establish regulatory frameworks and clear rules. An environment for public policy decision-making that is accompanied by public or private financial instruments requires legal certainty for both local and foreign investors. Additionally, it is key that there is a harmonized coexistence in the interaction between national and subnational governments, private initiative, and society.

It is imperative for the entire society to understand the climate issue and the need to search for different energy sources, as well as the different programs at the local level, or initiatives that have their origin in international agencies; this would allow it to trigger a multiplier effect in the most vulnerable sectors of the economy, such as the agricultural sector or the mining sector. Along with this, it is crucial to generate educational and awareness-raising content for society so that they become aware of what the environment represents and its potential effects.

Likewise, current conditions in the money market can open windows of opportunity for development banks so that they can offer structured instruments to the Andean Region. These instruments can be complemented with the experience Mexico has had in recent years in the placement of CKD and CERPIs in the market. The Inter-American Development Bank must undoubtedly play a leading role in this issue.

The quantitative analysis of financial flows shows that the possibilities of receiving external financing resources in the Andean Region depend on whether the economy is growing, whether there is local investment, and whether official aid is given for green energies. Likewise, the countries that have had greater consumption of renewable energy received greater resources from abroad into their financial system, which have undoubtedly been used for clean energy projects.

Furthermore, it is important to consolidate a model of institutional and legal certainty that allows public and private funds that come from abroad to have absolute confidence that the money financing the green projects of the countries in question will be used for the objectives established and that there will not be any legal or political uncertainty in their management.

Finally, it is important for national and subnational authorities to conduct a review of international funds, the agendas of autonomous organizations dedicated to the environment and, specifically, to consider the instruments of the Mexican financial sector as possible vehicles to bring resources to the sectors with the greatest impact on clean energy issues. In this sense, the Andean Region can promote its decarbonization projects in the Mexican market, given the possibility of investing resources from instruments such as CERPIs in projects located in other countries.

As next steps for the research and implementation of the series of measures and instruments analyzed in this document, it is crucial to focus on four main aspects:

1. Establishing public policies that institute adequate incentives and guarantees for external investments, whether as foreign direct investment or through the financing of development projects, regardless of the political position of the government in power.
2. Strengthening the role of the IDB and other Development Banks, Funds and International Organizations in the granting of credits and guarantees, with a greater offer of instruments with the structure to finance projects that have high potential in the medium term.
3. Improving the development, promotion and implementation of productive projects that favor decarbonization in the region; and
4. Determining investment needs with greater precision, as well as determining the optimal combination of public and private resources in the various projects proposed to be executed in the four countries at a supranational, national, or subnational level.

ANNEX A: METHODOLOGICAL NOTE OF THE ECONOMETRIC MODEL

Source

- » WORLD BANK
- » World development indicators
- » Last update 12/18/2023
- » Region: Latin America and the Caribbean (excluding high income)
- » Countries:
 - » Bolivia: Lower middle income
 - » Colombia: Upper middle income
 - » Ecuador: Upper middle income
 - » Peru: Upper middle income
- » Years: 1993 to 2022

Variables

Y - **Portfolio investments, net capital inflow** (balance of payments, US\$ at current prices): Portfolio securities include the net inflow of variable income securities, other than those recorded as direct investments and include stocks, securities, depositary receipts (U.S. or global) and direct purchases of shares in local stock markets by foreign investors. Data in US\$ at current prices.

X₁ - **CO₂ emissions** (kg per US\$ of 2010 GDP): Carbon dioxide emissions are those that come from the burning of fossil fuels and the manufacture of cement. They include carbon dioxide produced during the consumption of solid, liquid, gaseous fuels and from the burning of gas.

X_2 - **GDP growth** (annual %): Annual percentage growth rate of GDP at market prices in local currency, at constant prices. Aggregates are expressed in United States dollars at constant 2010 prices. GDP is the sum of the gross value added of all resident producers in the economy plus any product taxes, minus any subsidies not included in the value of the products. It is calculated without making deductions for depreciation of manufactured goods or for depletion and degradation of natural resources.

X_3 - **Renewable energy consumption** (% of total final energy consumption): Renewable energy consumption is the proportion of renewable energy in total final energy consumption.

X_4 - **Active interest rate** (%): The active interest rate is the one charged by banks for loans to first-line clients.

X_5 - **Total active population**: The total active population includes people 15 years old or older who satisfy the definition of Economically Active Population by the International Labor Organization: all people who provide work for the production of goods and services during a specific period. It includes both employed and unemployed people. While national practices vary in the treatment of groups such as the armed forces or seasonal or part-time workers, in general the labor force includes the armed forces, the unemployed, those seeking their first job, but excludes those who are dedicated to home care and other unpaid workers and caregivers.

X_6 - **Gross fixed capital formation** (% of GDP): Gross fixed capital formation (previously, gross domestic fixed investment) includes land improvements (fences, ditches, drains, etc.); acquisitions of facilities, machinery and equipment, and the construction of roads, railways and related works, including schools, offices, hospitals, private residential homes, and commercial and industrial buildings. According to the 1993 SNA, net acquisitions of valuables also constitute capital formation.

X_7 - **Official Net Development Aid** (US \$ at current prices): Net Official Development Assistance (ODA) includes loan disbursements in concessionary conditions (Net refunds of the principal) and donations granted by official agencies of members of the Development Assistance Committee (DAC), by multilateral institutions and by non-DAC countries to promote development and economic well-being in countries and territories on the DAC list of ODA recipients. It includes loans that have a donation element of at least 25% (calculated at a 10% discount rate). Data in US\$ at current prices.

Some previous variables were incorporated in the form of logarithms in the equation, in order to provide stability in the regressors, reduce atypical observations, and establish different views of the estimation:

X_8 - **GDP Growth logarithm**

X_9 - **Renewable Energy Consumption Logarithm**

X_{10} - **CO₂ Emissions Logarithm**

The panel data model takes advantage of the information provided by cross-sectional variability, identifying and estimating the parameters of a response function by exploiting the information on the variation of the independent variables included in the model. If the variables do not present excessive temporal variability but do present transversal variability, the panel data approach would provide extra capacity for this estimation. The general functional form is:

$$Y_{it} = \alpha + \beta_1 X_{1it} + e_{it}$$

Where:

- » i means the ith cross-sectional unit (country, person, etc.)
- » t means t time (year, quarter, month, etc.)

This formulation allows the combination of multiple individual and temporal parameters.

The Financial Flows into the country (Portfolio investment) were used as dependent variable (Y_{it}), while 10 variables were initially proposed as independent variables (X_{1it}), which are as follows: X_1 : CO₂ Emissions (X_{10} Logarithm of X_1); X_2 : GDP Growth (X_8 Logarithm of X_2); X_3 : Renewable energy consumption (X_9 Logarithm of X_3); X_4 : Interest rate; X_5 : Economically Active Population (EAP) rate; X_6 : Physical investment (Gross formation of fixed capital); X_7 : Net official development assistance.

As main results, it was obtained that the GDP Growth, Renewable Energy Consumption, Physical Investment and Official Development Assistance variables have a positive (and significant) impact on the flow of capital investments into the Andean Region. On the contrary, it turned out that neither CO₂ emissions nor the interest rate were significant for investment flows. The latter stands out, since it was expected that the most polluting countries/periods would have greater access to external financing.

Among the many technical specifications of Panel Data models, the most common are:

- » The “Fixed Effects” Model
- » The “Random Effects” Model

Panel model: Fixed effects, using 64 observations

4 cross section units (Countries) have been included

Time series length: minimum 13, maximum 19

Dependent variable: $L_InputportfolioInvestments$

Independent variables: $L_Gdpgrowth$, $L_renewableenergyconsumption$, official aid, gross capital formation

gretl: model 35**File Edit Tests Save Graphs Analysis LaTeX**

Model 35: Fixed effects, using 64 observations

4 cross section units (Countries) have been included

Time series length: minimum 13, maximum 19

Dependent variable: $L_InputportfolioInvestments$

	Coefficient	Typical Dev.	T statistic	P value
const	-1.74520	2.46638	-0.7076	0.4821
$L_Growthofthe-$	0.503604	0.193740	2.599	0.0119 **
1 Energyconsump-	4.28373	0.541410	7.912	1.08e-010 ***
Netofficialhelp-	3.06911e-09	6.69659e-010	4.583	2.61e-05 ***
Grossformatif-	0.167900	0.0692204	2.426	0.0185 **
Dep. Variable mean.	17.06450	T.D. of the dep. vble		2.646591
Square sum. Waste	131.9962	T.D. of the regression		1.535277
9-square MCVF (LSDV)	0.700879	9-square 'intra'		0.695512
F(7, 56) MCVF	18.74500	P value (of F)		1.31e-12
Log-authenticity	-113.9765	Criterion de Akaike		243.9531
Schwarz criterion	261.2242	Hannan-Quinn Crit.		250.7570
rho	0.096027	Durbin-Watson		1.634877

Joint test of the regressors (except the constant) –

Test statistic: $F(4, 56) = 31.9788$

with p value = $P(F(4, 56) > 31.9788) = 7.09883e-014$

Test of different intercepts by groups –

Null hypothesis: [The groups have a common intercept]

Test statistic: $F(3, 56) = 0.765165$

with p value = $P(F(3, 56) > 0.765165) = 0.518376$

Panel Model: Fixed effects, using 64 observations

4 cross section units (Countries) have been included

Time series length: minimum 13, maximum 19

Dependent variable: $\ln \text{InputportfolioInvestments}$

Independent variables: $\ln \text{Gdpgrowth}$, $\ln \text{renewableenergyconsumption}$, official aid, gross capital formation, EAP

gretl: model 37**File Edit Tests Save Graphs Analysis LaTeX**

Model 37: Fixed effects, using 64 observations

4 cross section units have been included

Time series length: minimum 13, maximum 19

Dependent variable: $\ln \text{InputportfolioInvestments}$

	Coefficient	Typical Dev.	T statistic	P value	
const	2.26048	3.09609	0.7301	0.4684	
$\ln \text{Growthofthe-}$	0.522194	0.188667	2.768	0.0077	***
1 Energyconsu-	3.06869	0.793583	3.867	0.0003	***
Netofficialhelp-	2.26739e-09	7.60083e-010	2.983	0.0042	***
GrossFormationof-	0.115256	0.0720758	1.599	0.1155	
ActivePopulation-	1.05078e-07	5.13409e-08	2.047	0.0455	**

Dep. Variable mean.	17.06450	T.D. of the dep. vble	2.646591
Square sum. Waste	122.6546	T.D. of the regression	1.493347
9-square MCVF (LSDV)	0.722048	9-square 'intra'	0.717061
F(8, 55) MCVF	17.85948	P value (of F)	8.58e-13
Log-authenticity	-111.6277	Criterion de Akaike	241.2555
Schwarz criterion	260.6854	Hannan-Quinn Crit.	248.9099
rho	0.123189	Durbin-Watson	1.572387

Joint test of the regressors (except the constant) –

Test statistic: $F(5, 55) = 27.8776$

With p value = $P(F(5, 55) > 27.8776) = 6.00015e-014$

Test of different intercepts by groups –

Null hypothesis: [The groups have a common intercept]

Test statistic: $F(3, 55) = 0.681583$

with p value = $P(F(3, 55) > 0.681583) = 0.567087$

Panel Model: Fixed effects, using 64 observations

4 cross section units (Countries) have been included

Time series length: minimum 8, maximum 13

Dependent variable: $I_InputportfolioInvestments$

Independent variables: $I_Gdpgrowth$, $I_renewableenergyconsumption$, interest rate, official aid

gretl: model 29

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Model 29: Fixed effects, using 64 observations

4 cross section units have been included

Time series length: minimum 13, maximum 19

Dependent variable: $I_InputportfolioInvestments$

	Coefficient	Typical Dev.	T statistic	P value
const	4.99689	2.08733	2.394	0.0200
1_Growthofthe-	0.448182	0.201134	2.228	0.0299
1 Energyconsump-	3.13068	0.735734	4.255	8.03e-05
Activeinterestrate	0.0264640	0.0164796	1.606	0.1139
Netofficialhelp-	3.37401e-09	6.94541e-010	4.858	9.94e-06
Dep. Variable mean.	17.06450	T.D. of the dep. vble		2.646591
Square sum. Waste	139.4426	T.D. of the regression		1.577988
9-square MCVF (LSDV)	0.684004	9-square 'intra'		0.678334
F(7, 56) MCVF	17.31679	P value (of F)		5.73e-12
Log-authenticity	-115.7327	Criterion de Akaike		247.4654
Schwarz criterion	264.7365	Hannan-Quinn Crit.		254.2694
rho	0.071692	Durbin-Watson		1.669747

Joint test of the regressors (except the constant) –

Test statistic: $F(4, 56) = 29.5235$

with value $p = P(F(4, 56) > 29.5235) = 3.22268e-013$

Test of different intercepts by groups –

Null hypothesis: [The groups have a common intercept]

Test statistic: $F(3, 56) = 0.405538$

with $p \text{ value} = P(F(3, 56) > 0.405538) = 0.749592$

Official Financing for the Productive Transition in the Andean Region

3. OFFICIAL FINANCING FOR THE PRODUCTIVE TRANSITION IN THE ANDEAN REGION

RABAH AREZKI

1. Introduction

The COP 28 also concluded with an historic agreement to transition away from fossil fuels.¹ As is the case for many other developing countries, the commitment of the CAN-4 (Bolivia, Colombia, Ecuador, and Peru) to a low-carbon transition thus remains imperative, but the financing gap in relation that transition make it a daunting task, especially considering the outlook for official transfers from rich to poor countries. The CAN-4 countries will have to walk a fine line. Notwithstanding the existing constraints, these countries will have to find ways to finance that transition as well as address other pressing social and development needs in a context of debt levels that are already elevated.

Borrowing from the domestic capital markets will help, but will not be sufficient, considering the magnitude of the financing needs. Alternatively, international capital markets could provide significant opportunities to finance the transition. One big idea is for the development partner to lead the way through the promotion of a “wholesale” approach by helping to regenerate the financial systems in CAN-4 economies. This would in turn mobilize domestic savings that could finance the needed economic transformation led by the private sector.

But even with such a wholesale approach, critical sectors for the energy transition will have to become investible. The target areas for investment in sectors such as energy, transport, and agriculture relate to both mitigation and adaptation. In turn, the governance of these sectors and the overall business environment will have to be improved. Official financing including through multilateral partners could act as a catalyst for much of the private sector investment needed. The present chapter explores the role of official financing to advance the low-carbon transition in CAN-4 economies.

Historically, the Paris Accord was a breakthrough in terms of global climate governance with the goal it set of limiting global warming to well below 2 degrees Celsius and preferably to 1.5 degrees compared to preindustrial levels. Countries have agreed to nationally determined contributions with national plans highlighting their climate actions. Yet richer economies are lagging when it comes to the promises of financial support they made in the Paris Accord to help poorer countries develop cleanly and adapt to climate change. Rich nations pledged US\$100 billion per year in funding from 2020 onward, but it can be

¹ See <https://wmo.int/news/media-centre/cop28-concludes-historic-agreement-try-tackle-climate-crisis>.

argued the actual annual amounts have been well below this figure. It has also been unclear whether the money will come from concessional financing, the private sector, or technology transfers.

Fast forward to the 28th session of the Conference of Parties (COP 28), which concluded in Dubai at the end of 2023, bringing some good news on the (official and nonofficial) climate finance front. The world agreed to operationalize the Loss and Damage Fund, dedicated to compensating countries vulnerable to climate change. Pledges worth US\$300 million were also announced toward that fund. The final decision of the COP 28 reiterated a call from 2021 to “at least double financing for adaptation.” Beyond the Loss and Damage Fund, the United Arab Emirates announced a US\$30 billion fund aiming to reach US\$250 billion dollar by 2030 for both adaptation and mitigation. The Green Climate Fund attracted a US\$3 billion new pledge from the United States, bringing its second replenishment to US\$13 billion.²

Back to the CAN-4 economies, they face different circumstances and incentives in pressing ahead with their low carbon transitions that are not in the least dependent on whether these economies are fossil fuel importers or exporters. Indeed, (sole) importers, as opposed to exporters, have stronger incentives to substitute away from energy sourced from fossil fuels and energy from renewable sources. While renewable energy, for example in the form of hydroelectric power, is already being utilized to a significant extent in the CAN-4 countries, fossil fuel continues to be relied on as feedstock for electricity and transport (Manzano and Sucre, 2023).

What is more, climate variability is affecting the reliability of renewable energy sources such as hydroelectricity and wind. For the low carbon transition in CAN-4 countries, understanding changes in weather patterns is thus paramount, a task that is made more challenging by the complex topography and atmospheric conditions that characterize countries in the Andean region as a whole.³ For some CAN-4 countries, the existing distribution infrastructure for natural gas will be hard to do away with in the short run. For others like Peru, the expansion of natural gas production (and mining activities) has been opposed by the local population, lending support to the energy transition.⁴ For all the CAN-4 countries, the energy transition will have to be tailored to context and account for preexisting elevated levels of inequality, which can further enflame social tensions.

CAN-4 countries need to take advantage of the noncarbon sources of energy (with which they are abundantly endowed), remove remaining fuel subsidies while cushioning the distributional and social impacts, and address the risks of being left with stranded hydrocarbon assets and related capital stock. The energy transition in these countries will require both significant financing and reforms of the governance and regulatory frameworks of the energy, transport, and agriculture sectors. The latter will allow the private sector to play a significant role in the transition.

Moving away from fossil fuels is inescapable and as mentioned earlier, CAN-4 countries have, to varying degrees, committed to doing so. But they cannot make the transition on their own. International support is very much needed, especially considering the gap in financing. Multilateral institutions such as the Inter-American Development Bank (IDB) and others active in the region can play an important role in facilitating the energy transition and supporting the necessary reforms. Importantly, multilateral institutions could to a greater extent use development financing to stimulate more private sector participation using so-called blended finance instruments such as guarantees. This paper explores how CAN-4 countries can

² See <https://www.unep.org/news-and-stories/story/after-cop28-questions-remain-communities-struggling-climate-change>.

³ See <https://online.ucpress.edu/elementa/article/10/1/00092/194534/The-complex-Andes-region-needs-improved-efforts-to>.

⁴ See <https://www.fitchratings.com/research/corporate-finance/peru-social-unrest-pressure-domestically-focused-corporates-natural-resources-utilities-energy-oil-gas-at-risk-15-02-2023>.

use official financing to successfully tap into private sources of financing to ensure development is both sustainable and inclusive.

Along these lines, the IDB and the World Bank have jointly committed to expanding their lending capacity, including by taking on more risk on their balance sheets.⁵ One way to achieve this is to scale up guarantees to catalyze the private sector while promoting access to country insurance schemes so that there is coverage for climate shocks. Eventually, the development of regional and global carbon markets could help better integrate the transition of the CAN-4 countries into the global transition. The promotion of better functioning markets, starting with clean energy markets, could help the CAN-4 countries foster sustainable and inclusive development, provided enough attention is paid to local content and job creation as part of the transition.

The remainder of the paper is organized as follows: Section II describes the state of renewable energy in the CAN-4 countries. Section III reports on the climate financing gap and the state of official finance in these countries. Section IV then reviews the available instruments for financing the transition. Section V explores the policy reforms needed to mobilize official climate financing and catalyze private financing and Section VI concludes.

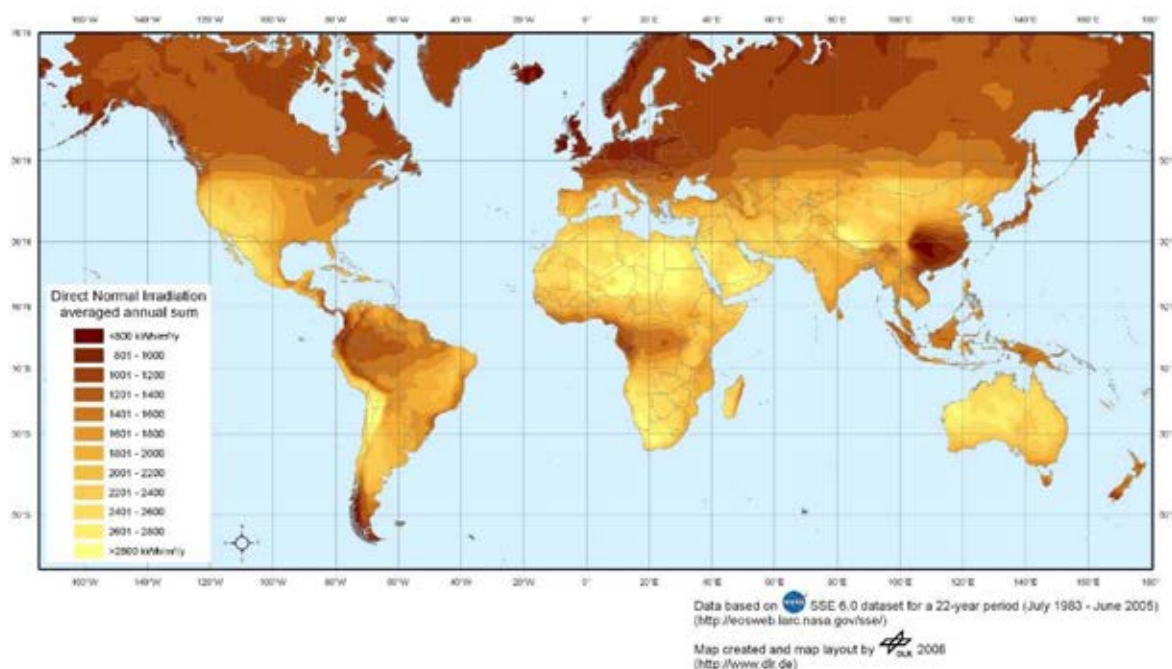
2. The state of renewable energy in the CAN-4 countries

The potential for electricity generation from solar photovoltaic sources in most countries around the world dwarfs their current electricity demand (Suri et al. 2020).⁶ Specifically in the CAN-4 countries, solar radiation is quite high, according to the U.S. National Aeronautics and Space Administration (Figure 1). There is also potential for more hydroelectricity, which is already an important source of energy in these countries, as well as for wind power, in relation to which the geography of the CAN-4 countries is very favorable (IRENA, 2023).

Further, the technological changes driving the transition from fossil fuels to renewable sources present sizable economic opportunities for the CAN-4 countries, especially as the costs of renewables such as solar and wind are declining. The authorities in these countries should continue to tap the subregion's vast pool of renewable resources in order to accelerate the transformation of their energy systems, which would have the doubly beneficial effect of reducing greenhouse gas (GHG) emissions while keeping energy costs from rising. In isolated and lagging regions, promoting deconcentrated energy systems could also help economically empower local communities.

⁵ See <https://www.devex.com/news/idb-head-s-big-plan-work-with-the-world-bank-sweet-the-balance-sheet-106386>.

⁶ See <https://www.worldbank.org/en/topic/energy/publication/solar-photovoltaic-power-potential-by-country>.

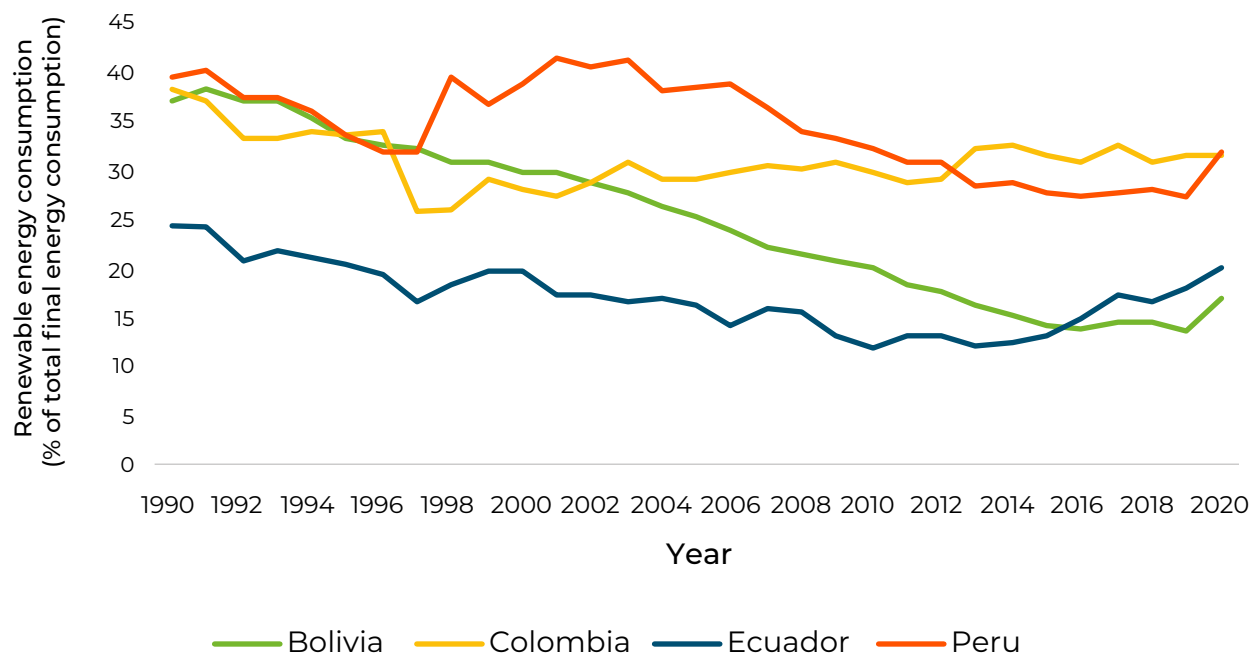
Figure 1. Potential for Solar Energy

Several CAN-4 economies already are investing heavily in renewables. Peru, Ecuador, and Colombia are leading the way in Latin America and the Caribbean (LAC) and have made good progress toward renewable energy.⁷ But overall, the pace of installation of new renewable capacity in the CAN-4 countries lags behind that of the rest of the world (IRENA, 2023). IRENA projects that the world capacity in renewable energy has to triple to meet climate goals.⁸ In a world in which renewables accounted for 81 percent of total capacity expansion in 2022, the renewables share in total energy stagnated in the CAN-4 countries (Figure 2).⁹ Energy efficiency is a low-hanging fruit, especially for CAN-4 countries. Authorities should promote a campaign to improve energy efficiency in addition to undertaking energy pricing reform.

7 See <https://www.idbinvest.org/en/blog/energy/how-latin-america-leading-renewable-energy-space>.

8 See <https://www.irena.org/Digital-content/Digital-Story/2023/Dec/Tripling-renewables-is-key-to-meeting-climate-goals>.

9 See https://mc-cd8320d4-36a1-40ac-83cc-3389-cdn-endpoint.azureedge.net/-/media/Files/IRENA/Agency/Publication/2023/Mar/IRENA_RE_Capacity_Statistics_2023.pdf?rev=d2949151ee6a4625b65c82881403c2a7.

Figure 2. Share of Renewable Energy in Total Energy Consumption, CAN-4 Countries

Source: World Bank, World Development Indicators.¹⁰

CAN-4 countries should also promote deconcentrated solar power where appropriate, such as rooftop solar power. That would allow for a shift from inefficient and harmful fuel subsidies toward subsidies, including in the form of tax credits. Consumers would then act as producers, which would facilitate acceptance of market forces, as a higher price of electricity could be beneficial for those reselling solar electricity to the grid.

¹⁰ See <https://databank.worldbank.org/source/world-development-indicators>

3. The state of official climate finance in the CAN-4 countries

The climate financing gap in CAN-4, and more generally in LAC, is large but there is sufficient liquidity available globally to tap into. Globally, the climate funding gap is at least US\$4.3 trillion in annual finance flows, with 20 percent year-on-year increases through 2030 in place according to Ehlers et al. (2022). These authors characterize the gap in adaptation finance in LAC as being 13 times the current investment levels versus 10 to 18 times globally; consequently, the region is ranked third, following East Asia and the Pacific (IDB, forthcoming publication).

The energy transition in the CAN-4 countries will also require a significant level of financing. Large investments in energy, transport, and agriculture systems are necessary to both mitigate and adapt to climate change. For instance, the World Bank (2022) estimates that a country like Peru will have to invest about 4 percent of its GDP over a decade just on adaptation.¹¹¹² The breakdown of needs for climate finance to close the gap is not consistently available at the country or subregional levels. The available data on investment needs at the country level from UNFCCC presented in the Nationally Determined Contribution (NDCs) and National Adaptation Plans (NAPs) shows that CAN-4 countries have listed several billions of dollars of climate financing gap each year for over a decade.¹³ These plans are being adjusted and tailored to the commitment these countries have made and reiterated during various climate negotiations.

Concessional financing is currently relatively small, but could be a catalyzing source of climate financing. According to the Climate Policy Initiative, concessional funding globally represented about 16 percent of total tracked climate finance.¹⁴ This goes to show that official financing will have to further catalyze private financing sources to be successful.

The evolution of aggregate climate finance from multilateral development banks in CAN-4 countries, according to the available data from the 2022 Joint Report on Multilateral Development Banks' Climate Finance, shows a clear positive trend toward climate finance in all countries (Table 1).¹⁵ At the same time, the flows remain relatively small and volatile. Indeed, the CAN-4 countries have attracted little of the global liquidity and much remains to be done to accelerate the potential of these countries to attract climate finance.

Emery (2023) conducted a forensic study of IFC's scaling solar program that showed the program did not scale solar as it had intended to and nor did it scale the solar market.¹⁶ The amount of private sector investment crowded in was not greater than, but rather a fraction of the concessional financing amount deployed. This author argues that in spite of that sobering reality, transparency concerning both explicit and implicit subsidies in the renewable sector is essential to educate the market about the true costs of scaling and the ways to do so. This author also argues that more concessional financing for renewables is thus needed. Official financing should play a greater role in tapping into that global liquidity, a topic to which we turn in more detail in the next section.

11 See <https://documents1.worldbank.org/curated/en/099242412052213917/pdf/P177137005d6390370b4fa0a6c67b4248ca.pdf>

12 LAC aggregate statistics are presented when data for CAN-4 countries are not available.

13 See https://unfccc.int/sites/default/files/resource/54307_2%20-%20UNFCCC%20First%20NDR%20technical%20report%20-%20web%20%28004%29.pdf.

14 See <https://www.climatepolicyinitiative.org/wp-content/uploads/2022/10/Global-Landscape-of-Climate-Finance-A-Decade-of-Data.pdf>.

15 See <https://publications.iadb.org/en/2022-joint-report-multilateral-development-banks-climate-finance>

16 See <https://energyforgrowth.org/article/solar-cant-scale-in-the-dark-why-lessons-about-subsidies-and-transparency-from-ifcs-scaling-solar-zambia-can-reignite-progress-toward-deploying-clean-energy/>.

Table 1. Climate Finance from Multilateral Development Banks in CAN-4 Economies (in US\$ millions)

	2015	2016	2017	2018	2019	2020	2021	2022
Bolivia	405	373	321	363	124	77	1	196
Colombia	182	904	747	719	980	657	1 595	2 014
Ecuador	582	325	27	792	616	446	317	832
Peru	85	309	306	201	203	287	571	1 476

Source: 2022 Joint Report on Multilateral Development Banks' Climate Finance.¹⁷

The state of climate finance is heterogeneous across countries in LAC and so are the needs. In 2019–2020, an overwhelming share of climate finance went toward mitigation (79 percent) as opposed to adaptation (14 percent) in LAC. Furthermore, there was a large degree of heterogeneity across countries and subregions in LAC in the allocation of climate finance. In the Andean region, 56 percent of climate finance went toward mitigation as opposed to 21 percent in the Caribbean, 58 percent in Central America, and 73 percent in the Center Cone. With regard to adaptation, 29 percent of climate finance in the Andean region was allocated to such efforts, while the proportions are 61 percent for the Caribbean, 28 percent for Central America, and 22 percent for the Center Cone.

The breakdown between public and private sources of financing and by type of financing (for both adaptation and mitigation) is as follows: in LAC countries the slight majority of sources were public (52 percent vs. 48 private) and took the form of debt (see Table 2 for a more detailed breakdown by institution type). Of the public-sector sources of climate finance, 27 percent originated from multilateral development finance institutions and of the private-sector sectors, 25 percent was from corporations and 16 percent from commercial financial institutions. In terms of instruments, 53 percent of climate finance in LAC were in the form of debt instruments, while 33 percent were equity-related instrument and 5 percent in the form of grants. The balance between debt and equity was more balanced in the case of adaptation finance than in the case of mitigation finance, which is, however, the lion's share of climate finance in LAC.

¹⁷ See <https://publications.iadb.org/en/2022-joint-report-multilateral-development-banks-climate-finance>

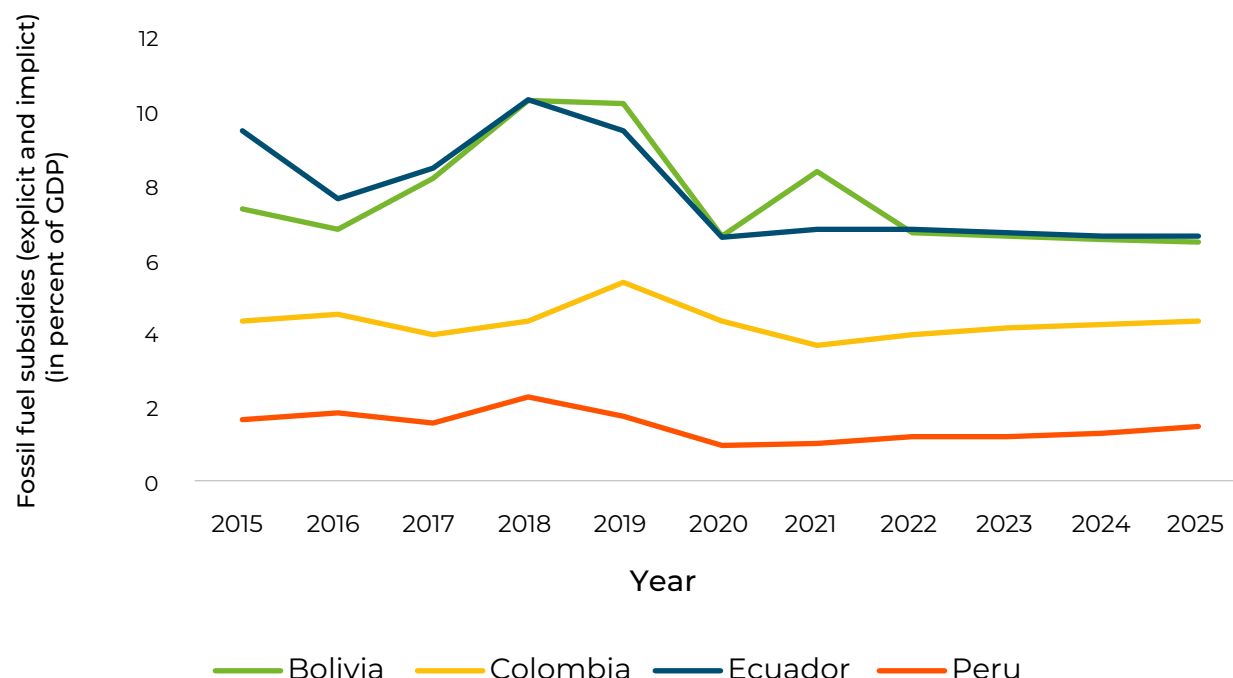
Table 2. Climate finance by institution type, LAC (in US\$ millions)

	2019	2020	2019/20 Average
Private	18,158	15,697	16,927
Commercial FI	6,588	4,596	5,592
Corporation	9,546	7,903	8,724
Funds	95	205	150
Households/individuals	1,620	2,379	1,999
Institutional investors	238	567	403
Unknown	71	48	59
Public	19,184	17,571	18,378
Bilateral DFI	4,040	2,799	3,420
Export credit agency (ECA)	450	25	237
Government	1,291	864	1,077
Multilateral climate funds	779	648	713
Multilateral DFI	9,097	10,159	9,628
National DFI	2,016	1,727	1,871
Public fund	50	225	137
Unknown	1	4	3
State-owned FI	1,117	922	1,020
SOE	343	199	271

Source: Climate Policy Initiative.¹⁸

The LAC countries in general and the CAN-4 countries in particular need to increase by their investment in the power sector by several times to close the investment gap so that they can meet the region's electricity needs while limiting GHG emissions. Luckily, there is a growing interest in climate friendly investments in the global financial community. To tap into that interest, CAN-4 economies must tackle the remaining issues that constrain the ability of their energy systems to absorb investment. Although sovereign borrowing cannot be the exclusive driver of climate friendly investment, it can be a catalyst.

¹⁸ See <https://www.climatepolicyinitiative.org/>

Figure 3. Fossil Fuel Subsidies in CAN-4 CountriesSource: IMF.¹⁹

Most CAN-4 countries have elevated levels of external and domestic debt, especially Ecuador and Colombia. The private sector, both domestic and foreign, should thus be a conduit of climate finance for the region. Private investors, however, face numerous barriers. For example, the traditionally high financing costs and tight caps that preclude companies from adjusting energy tariffs to cover those costs make it difficult to develop power purchase agreements (PPAs) that are bankable—that is, PPAs deemed viable and for which operators can receive financing. The remaining fuel subsidies also need to be removed to provide the right incentives to consumers and corporations alike (Figure 3). Private investment in electricity sectors would be encouraged by the development of decarbonized transportation assets, including railways and other mass transit options, which will also ensure demand. Private sector investment, however, will require a level playing field.

¹⁹ See <https://www.imf.org/en/Topics/climate-change/energy-subsidies#Energy%20Subsidies>

4. Instruments to mobilize official finance in CAN-4

Climate finance offers a variety of instruments that development partners can help catalyze through various interventions, of which the primary one should be the expansion of absorptive capacities. Carbon credits, for example, allow companies to offset their GHG emissions in return for investments in carbon reductions made elsewhere—such as in a developing country. Investors that make carbon-reducing investments in a CAN-4 country, for example, receive credits that they can sell to an enterprise in an advanced economy that needs to offset its emissions. The use of carbon credits, each worth a ton of carbon, needs to be scaled up, especially for the CAN-4 countries. As an illustration, 10 and 11 projects in Peru and Colombia, respectively, for “reducing emissions from deforestation and forest degradation” (REDD) were registered under the Verified Carbon Standards (VCS) and over 64 million and 31 million credits were issued in 2022 in Peru and Colombia, respectively.²⁰

There are other types of instruments for attracting needed funds to CAN-4 countries that development partners can support. Green bonds are fixed income instruments that specifically support climate- or environment-related investment. Those offered by CAN-4 governments represent a tiny fraction of the global issuance of green bonds (Table 3). Green bonds may be more appropriate in more-mature markets where there is less demand uncertainty. Nevertheless, green bonds and other nature and blue bonds may be an important substitute for resource-backed loans granted by China, which have tended to be opaque. In 2023, Ecuador completed the largest-ever debt-for-nature swap, which enabled the country to allocate significant resources toward conservation.²¹

The IDB currently provides assistance with technical aspects, capacity building, and knowledge dissemination to prospective public sector issuers. First, the Green Bond Transparency Platform, aimed at transparency, harmonization, and reporting of green bond issuance, records and discloses all the green bonds issued in the region. Second, the NDC Accelerator Multidonor Trust Fund identifies green and social expenditures in countries’ budgets and supports governance frameworks around sustainability, for example through the certification and issuance of bonds in domestic and international markets.²²

Table 3. Green Bond Issuances by Colombia and Peru, 2014–2022 (in US\$ millions)

	2014	2015	2016	2017	2018	2019	2020f	2021	2022
Colombia	0	0	0	43.573	106.8708	0	62.7189	575.6093	0
Peru	408	0	0	0	26.1855	1278.889	200	0	30

Source: IMF.²³

²⁰ See <https://www.sylvera.com/blog/redd-carbon-credits-2022>.

²¹ See <https://climatepromise.undp.org/news-and-stories/how-countries-latin-america-and-caribbean-are-financing-their-climate-goals>.

²² See <https://www.iadb.org/en/story/sovereign-sustainable-bonds-core-financing-instruments-sustainable-development>.

²³ See <https://climatedata.imf.org/datasets/8e2772e0b65f4e33a80183ce9583d062/explore>

An important mode of intervention of development finance partners is blended finance. Blended finance combines public or philanthropic interventions with private money on a development project. Blended finance can take the form of equity investments, below-market loans or local currency loans, as well as credit guarantees for the repayment of principal and interest on corporate loans or bonds. As argued by Garbacz et al. (2021), the advantage of guarantees in blended finance is that they do not immediately require outflows of funding including from donors or public entities are not immediately required. Guarantees are also useful for mitigating commercial, credit, and political risks and help shift the risk-return profile of investments and alleviate credit restrictions for underserved borrowers.

Guarantees, including from development banks, are a top priority with regard to scaling up climate investments in CAN-4 countries. Other important instruments that can help bolster markets are insurance schemes which can stimulate risk taking. A third source of climate investment is impact investing, which could be particularly fitting for economies with relatively small private sectors. Impact investors provide capital to companies and organizations that enable them to achieve social and environmental goals. The relatively small sizes of the private sectors and the multiple obstacles in many CAN-4 countries make that form investment appropriate and can also help avoid the pitfalls of sovereign borrowing as the sole conduit of private investment.

Public-private partnership (PPPs) are other modes of using official finance to catalyze the private sector. Climate investment could in large part be seen as an infrastructure-financing problem. Many of the mitigation efforts will be in the form of infrastructure. A potential source of funding for infrastructure projects, such as those required for energy companies, are institutional investors that are on the lookout for higher-yielding investment projects that help build climate resiliency. One of the big challenges to channeling global savings into infrastructure investment is the need for a pipeline of potential infrastructure projects that can in turn be securitized with the cooperation of the public sector. Constructing a pipeline for projects requires the building of capacity in the public sector for project preparation, appraisal, and design to eventually turn them in bankable projects, including through the use of guarantees.

Beyond this important domestic capacity consideration, Arezki et al. (2017) identify the main institutional obstacles that prevent the flow of savings toward infrastructure investment and propose a key institutional fix to unlock the current savings glut and reverse the trend of secular stagnation. These authors argue that the solution is to reshape PPPs in infrastructure and the classic model of multilateral development bank (MDBs). Traditionally, PPPs have been bilateral contracts between a private concession operator and a government agency, while development banks offer financing to projects that could not attract private funding but have a high development impact. Arezki et al. (2017) propose a model in which PPPs can involve three or even four partners, with the additional partners being a development bank and long-term institutional investors. And the new model for development banks is to transform them into “originate-and-distribute” banks for PPP infrastructure projects, an approach aims to maximize much-needed private sector financing.

Box 4.1 The role of multilateral institutions in surveillance and technical assistance in climate

Multilateral institutions have undertaken the analysis of the impact of climate change and some of the ways to address it. For example, the IMF has improved its coverage of climate issues in its surveillance and policy work and has started a Resilience and Sustainability Trust to help finance climate-related balance-of-payments problems. The World Bank has introduced Country Climate and Development Reports and is examining ways to expand its climate lending. Despite these steps, calls are growing for the multilateral institutions, especially the World Bank, to ramp up their efforts.

Multilateral institutions could play an important role in analyzing data and advising CAN-4 countries on the spillover effects of carbon pricing and carbon border adjustments in large oil and natural gas consumer markets. These institutions could also play an important role in supporting Can-4 countries with the issuance of green bonds and the eventual development of global carbon markets. Peru is gearing up for the implementation of carbon market instruments. As part of this scheme, a standard must be set for ensuring environmental integrity of international transfers of mitigation outcomes.

Even in countries that do not need multilateral institutions to finance projects, the latter need to adapt their advice to these countries just as to other countries in CAN-4 to ensure their spending programs toward the energy transition are consistent with their climate commitments and that the quality of spending is high. Multilateral institutions will need to size up and tailor their technical assistance to the energy transition efforts in the CAN-4 context. Importantly, the multilateral institutions need to help create a framework to coordinate the efforts of individual CAN-4 countries and the various international agencies involved in supporting those countries with the energy transition. That will eventually support the development of regional and global carbon markets that could help better integrate the transition of the CAN-4 countries into the global transition. Without this, there is a considerable risk of the duplication of efforts and wastage of the financing that the global community may be providing to support the energy transition.

Multilateral institutions have undertaken the analysis of the impact of climate change and some of the ways to address it. For example, the IMF has improved its coverage of climate issues in its surveillance and policy work and has started a Resilience and Sustainability Trust to help finance climate-related balance-of-payments problems.²⁴ The World Bank has introduced Country Climate and Development Reports and is examining ways to expand its climate lending.²⁵ Despite these steps, calls are growing for the multilateral institutions, especially the World Bank, to ramp up their efforts.²⁶

Multilateral institutions could play an important role in analyzing data and advising CAN-4 countries on the spillover effects of carbon pricing and carbon border adjustments in large oil and natural gas consumer markets. These institutions could also play an important role in supporting Can-4 countries with the issuance of green bonds and the eventual development of global carbon markets. Peru is gearing up for the implementation of carbon market instruments. As part of this scheme, a standard must be set for ensuring environmental integrity of international transfers of mitigation outcomes.

Even in countries that do not need multilateral institutions to finance projects, the latter need to adapt their advice to these countries just as to other countries in CAN-4 to ensure their spending programs toward the energy transition are consistent with their climate commitments and that the quality of spending is high. Multilateral institutions will need to size up and tailor their technical assistance to the energy transition efforts in the CAN-4 context. Importantly, the multilateral institutions need to help create a framework to coordinate the efforts of individual CAN-4 countries and the various international agencies involved in supporting those countries with the energy transition. That will eventually support the devel-

²⁴ See <https://www.imf.org/en/Topics/Resilience-and-Sustainability-Trust>

²⁵ See <https://www.worldbank.org/en/publication/country-climate-development-reports>

²⁶ Some of the measures discussed below are also discussed by Fries (2022a, 2022b). Fries (2022b) particularly emphasizes the role of MDBs in encouraging low-carbon technologies.

opment of regional and global carbon markets that could help better integrate the transition of the CAN-4 countries into the global transition. Without this, there is a considerable risk of the duplication of efforts and wastage of the financing that the global community may be providing to support the energy transition.

Development partners have committed to significantly increasing the financing of projects and helping mobilize private sector investments. The IDB as well as other development banks are stepping up their lending toward energy investment to help CAN-4 countries fill the gap, including by catalyzing private sector investment.²⁷ To do so the multilateral institutions need to modify their lending facilities to support CAN-4 countries with the energy transition and to increase resilience in the face climate change. The IMF has set up a Resilience and Sustainability Trust, and the IDB jointly with the World Bank has indicated its objective of raising its contribution to climate finance, especially for setting up green energy projects. That said, the amounts involved are still small and the mechanisms to encourage private sector finance are not adequate to the task.

MDBs could encourage financing through equity participation in private firms involved in the energy transition and first-loss guarantees. Another step MDBs could take relates to their self-imposed constraints in terms of the size of their capital and their risk management policies. The World Bank, for example, is constrained by its desire to maintain its high credit rating and provisioning policies for loan guarantees. The case can be made that given the large financing needs in developing countries for energy transition, those policies need to be relaxed as argued in a recent G20 independent review Boosting MDBs' investing capacity. (2022).²⁸ Furthermore, the World Bank and other MDBs should scale up their use of guarantees to catalyze private sector investment. Multilateral institutions should not just lend more, they should ensure these loans have transformational impact, for example by promoting decentralized solar power and more generally developing feedback loops where citizens have more of a voice and leaders, including at the local level, are held accountable.

Development partners can also play an important role in facilitating access to country insurance. The intensification of the frequency and magnitude of shocks stemming from climate change risks shifting the balance of financing toward emergency funding and away from development finance aimed at addressing structural deficiencies. In the medium term, available resources may dry out and the unaddressed structural deficiencies will make countries perpetually vulnerable to shocks. What is more, the series of crises may be recurring and intensifying, especially considering the tightening global financial conditions, climate change, and the state of global health systems. That is particularly relevant for CAN-4 countries, which are particularly at risk in terms of massive climate shocks.

Brunnermeier (2021) offers a clear and simple definition of the concept of resilience in the context of the COVID-19 pandemic for advanced economies. In a nutshell, this author defines resilience as the reversion to the mean, that is, going back to “normal.” Economies should be wired through policies and institutions in a way that enables them to weather shocks and bounce back. For developing nations like the CAN-4 countries, however, reverting to normal is not an option. The concept of uber-resilience is more fitting for developing countries. Both the authorities in developing countries and development partners should aim at addressing preexisting structural deficiencies so that these countries can both bounce back and further transform.

To help developing countries achieve uber-resilience, the architecture for financing development should create a continuum between the concessional aid bucket and the bucket of so-called market-based

²⁷ See Arezki et al. (2017) for a discussion of the role of MDBs in originating and distributing infrastructure projects in order to tap into investment from institutional investors, including sovereign wealth funds.

²⁸ See https://www.dt.mef.gov.it/export/sites/sitodt/modules/documenti_it/news/news/CAF-Review-Report.pdf

instruments. That continuum will ensure that reforms and interventions ex ante are effectively graduating developing countries from aid dependency.

For this to happen, development institutions need to change their incentives structures to promote more innovations with regard market instruments, as opposed to simply boasting about volume without impact on the ground.

The IDB has innovated in that regard. Under the leadership of the Connectivity, Markets and Finance Division's Risk Financing and Insurance Group, the IDB has become one of the leading multilateral development institutions providing financial coverage in the LAC region for earthquakes, hurricanes, floods, wildfires, droughts, and public health risks.²⁹ Of course, there are uninsurable shocks that will in some cases preclude market-based instruments from being put in place. Yet it is likely that the absence of available insurance against extreme events for developing countries is also in large part linked to the absence of transparent disclosure on those countries' vulnerability to shocks.

In a world increasingly faced with intensifying shocks, developing countries have been relying solely on a development architecture that is mainly reactive. To assist developing countries in achieving a form of uber-resilience, that financing architecture has to be geared toward market-based instruments that stimulate policy interventions and disclosure, which in turn will help build better in all sectors.

5. Needed: Policy reforms to scale official finance and catalyze private sector financing

Fighting climate change requires more than official financing of infrastructure projects. It also requires policies to foster technological breakthroughs and appropriate tax and trade policies to incentivize sustainable activities—especially in logging and land management. Sovereign borrowing cannot be the exclusive driver of climate-friendly investment. The CAN-4 countries need to attract private investors in a significant way.

A growing concern is that the sovereign debt situation of many CAN-4 countries has deteriorated considerably over the past few years following a series of shocks ranging from the COVID-19 pandemic to the fallout from the war in Ukraine as well as frequent and massive climate events.³⁰ This has an impact on the willingness of international investors to go into countries, given that potential sovereign distress may impact their investment even if it doesn't involve any lending to the government. Further attention to debt sustainability with the support of the international community where appropriate will help unlock the potential for private sector climate investment. In tandem with the efforts by the international community to help fix the debt situation, the authorities in CAN-4 countries need to do their part by addressing absorptive-capacity issues both upstream and downstream of the energy sector.

On the upstream front, the limited disclosure and the scarcity of data on the environmental impact of investments and on forecasts about weather patterns in CAN-4 countries could discourage investors.³¹ That limited disclosure is in stark contrast with rising demands for more information from shareholders in advanced economies. International shareholders are insisting they be able to evaluate the environmental and social consequences of their investments. A platform to track climate finance in Ecuador has been set up that integrates environmental-spending tracking tools into the budget process, which is a sign of progress.

²⁹ See <https://www.iadb.org/en/who-we-are/topics/financial-markets/risk-financing-and-insurance-solutions>.

³⁰ See <https://time.com/5702556/climate-change-andes-mountains/>.

³¹ See <https://online.ucpress.edu/elementa/article/10/1/00092/194534/The-complex-Andes-region-needs-improved-efforts-to>.

In addition, governments must take steps to modernize and broaden their at-times thin financial sectors to permit the kinds of financing activity needed to support global investment. Domestic financial systems in many CAN-4 countries can be seen as “clogged conduits” for foreign investment. Too often domestic financial sectors are too thin and are subject to a form of “financial repression” that channels savings away from the private sector. Sovereign borrowing cannot be the exclusive driver of climate-friendly investment. In select countries capital controls and the lack of currency swap instruments affect banks that borrow in foreign currency—albeit several countries in CAN-4 are dollarized. In turn, these obstacles make it difficult to fund projects that generate receipts in local currency, making these projects not bankable.

In this context, one big idea is for the development partner to lead the way through the promotion of a “wholesale” approach that would help regenerate financial systems in LAC economies generally and CAN-4 economies in particular. The goal here is to mobilize domestic savings to finance private-sector-led economic transformation. Concretely, the development banks could more directly use their Preferred Creditor Status to bring in both domestic and cross-border commercial lenders to finance more lending to the private sector and job creation in the green sector.

The sector that produces and distributes electricity is largely overregulated in several CAN-4 countries albeit improvement in governance has taken place in recent decades.³² Electricity tariffs are tightly controlled and are too low for the sector to be viable, with the sector suffering from a chronic lack of investment that results in recurring power outages. To make the power sector efficient and attractive to investment, there is a need for the unbundling of the generation segment, which is competitive, and the distribution sector. In other words, the generation segment should be separated from the noncompetitive distribution segment.³³ Promoting competent and independent regulators at the national and regional levels is crucial to achieving efficiency and attracting needed investments.

On the downstream front, the transport sector is another that needs investment to reduce its carbon emissions. In the CAN-4 countries, inefficient public transportation blocks emissions reforms and is the main reason for pervasive fuel subsidies. Developing decarbonized transportation assets—including railways and other mass transit options—will help ensure energy demand predictability and stimulate investment in the electricity sector.

However, the high financing costs and tight caps that preclude companies from raising tariffs to cover those costs reduce the availability of bankable PPAs. The tightening of global financing conditions is adding to rising financing costs and may eventually cut several CAN-4 countries off from capital markets, making it difficult to borrow for climate investment. What is more, the thirst for energy security in Europe and beyond following the Ukraine invasion has triggered a resurgence of deals involving fossil fuel assets. That may potentially derail the CAN-4 trajectory toward decarbonization.

There are several other barriers to investment, including the lack of domestic climate and social standards, that governments must address to encourage climate finance in CAN-4 countries. Economic and societal goals need to come into focus. There is a need to develop local firm capabilities above and beyond foreign direct investment and the needed transfer of technology. In tandem with meeting environmental goals and standards, the focus should be on creating good green jobs, especially for the large pool of youth who constitute a significant proportion of the population in CAN-4 countries.

³² See <https://www.sciencedirect.com/science/article/abs/pii/S0957178720300990>.

³³ See <https://fsr.eui.eu/unbundling-in-the-european-electricity-and-gas-sectors/>.

Box 5.1 Challenges to financing the productive transition in Venezuela

Venezuela is endowed with vast reserves of fossil fuel that include the largest reserves of crude oil in the world. Venezuela has also a great deal of potential in renewable energy including solar. However, years of mismanagement following the oil boom in the 2000s combined with sanctions imposed by the United States starting in 2014 have plagued the economy and the energy system with enormous challenges, which led to Venezuela's defaulting on its debt obligations in 2017. The state-owned oil company PDVSA also defaulted on its obligations. The country has been embroiled since in failed debt-restructuring attempts. What is more, the production of oil and natural gas have been declining for years, though there have recently been signs of recovery. Finally, the electricity system has been faced with frequent blackouts.

Renewed efforts to bring the financial turmoil of Venezuela to an end, including by easing U.S. sanctions in 2023, suggest that Venezuela can progress with the transformation of its energy systems. Doing so is critical for both restoring the country's macroeconomic and social imbalances today and for tackling the medium-term risks associated with stranded assets. According to the International Energy Agency, the Venezuela energy mix is heavily skewed toward fossil fuels, mostly natural gas and crude oil. The electricity system in Venezuela is heavily reliant on a renewable, hydropower; however, the system is at the mercy of the vagaries of water levels of the Guri Dam, which supplies 70 percent of Venezuela's electricity. Venezuela has plenty of other renewable energy sources on which it can draw effectively to achieve a productive transition.

The transformation of Venezuela's energy systems will require large investments. Luckily, there is growing interest in climate-friendly investments among the global financial community. To tap into this interest, the Venezuela economy must first tackle its debt crisis to signal to investors it is open for business. The Venezuelan government also needs to remove administrative and legal obstacles to private sector investment. As reiterated above with regard to the CAN-4 countries as a group, sovereign borrowing cannot be the exclusive driver of climate-friendly investment. The private sector, both domestic and foreign, should be part of the solution for climate finance. Developing decarbonized transportation assets—including railways and other mass transit options—will help reduce GHG emissions, ensure energy demand predictability, and stimulate investment in the electricity sector. This is no easy task. There are problems related to the economic governance of the energy sector as well as complementarities between the energy sector and other sectors that hamper the ability of the Venezuelan economies to attract investment.

The domestic financial system in Venezuela is a 'clogged conduit' for foreign investment. Too many directives and regulations plague the financial system, which is thus subject to a form of 'financial repression'—channeling savings away from the private sector. Venezuela lacks currency convertibility and has strict capital controls, limiting the prospects for investment and the ability to borrow. The restrictions and lack of currency swap instruments affect banks that borrow in foreign currency. In turn, these obstacles make it difficult to fund projects that generate receipts in local currency, making such projects not bankable.

To make climate-friendly projects bankable, energy subsidies need to be phased out. Energy is heavily subsidized in Venezuela; the tight caps that preclude companies from raising tariffs to cover costs limit the availability of bankable PPAs. Venezuela also needs to make these changes in a socially acceptable manner. If authorities can push through the right changes and thus resolve some of these challenges, Venezuela will be able to tap into the growing interest of global investors in making climate-friendly investments.

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³⁴ For the basic decomposition of the energy and electric mixes for Venezuela, see: <https://www.iea.org/countries/venezuela#>.

6. Conclusion

The transformation of the energy systems of the CAN-4 countries will require large investments. Luckily, there is growing interest in climate-friendly investments in the global financial community. To tap into that interest, the CAN-4 economies must tackle the long-standing issues that constrain the ability of their energy systems to absorb investment. Sovereign borrowing cannot be the exclusive driver of climate-friendly investment. The private sector, both domestic and foreign, should be part of the climate-finance solution for the CAN-4 countries. Traditionally, high financing costs and tight caps that preclude companies from adjusting tariffs to cover those costs have made it difficult to develop bankable PPAs. Developing decarbonized transportation assets—including railways and other mass transit options—will also help reduce GHG emissions, ensure energy demand predictability, and stimulate investment in the electricity sector.

The CAN-4 countries have a challenging task ahead of them. There are problems related to the economic governance of the energy sector as well as complementarities between the energy sector and other sectors that hamper the ability of CAN-4 economies to absorb investment. In turn, these problems discourage the global investor community. However, if authorities can make the right changes, the CAN-4 economies—especially those with little available capital—will be able to tap into the growing interest of global investors in making climate-friendly investments in a socially acceptable manner. A beneficial side effect will be that such investments will help fix the problem of the increasingly onerous and unreliable access to energy and other public services that has exacerbated social tensions.

Furthermore, the new preferences of investors in advanced economies for climate-friendly investments can promote green investments in the CAN-4 economies. Shareholders want to preserve the environment and create societal benefits and accordingly are demanding more disclosure and transparency on the part of companies operating in the CAN-4 countries. Ensuring more transparency and disclosure could bring long-lasting governance gains for these countries and narrow the gap between stakeholders in advanced economies such as pensioners and CAN-4 stakeholders such as nature workers. By embracing disclosure standards, CAN-4 authorities will attract more investments and ensure these investments have the intended societal and environmental impact.

Regionalized energy markets are bigger and can attract and catalyze investments. Moreover, regionalizing regulators other institutions could provide comfort to investors, as doing so would enable the regulatory framework to remain above the domestic political concerns that plague national regulators. Regionalizing institutional arrangements, including in relation to tenders and the regulatory apparatus, is thus paramount. The European Union provides an interesting model for the regionalization of energy markets and networks industries such as transport. Capital market integration is an important avenue for funding large-scale cross-border climate-related projects. It could also help the CAN-4 countries integrate into the global financial economy and promote inclusive development.

Preparing Financial Systems for Climate Finance in the Andean Region

4. PREPARING FINANCIAL SYSTEMS FOR CLIMATE FINANCE IN THE ANDEAN REGION

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1. Introduction

The climate crisis represents a great challenge for the countries of the Andean Community (CAN), not only due to the region's vulnerability to climate change, but also due to its dependence on fossil fuels and sectors with high Greenhouse Gas emissions (GHG). In this sense, resource mobilization for climate action takes on crucial importance.

On the one hand, it is necessary to mobilize resources for adaptation and increase the region's resilience to the effects of climate change. On the other hand, countries have committed to goals regarding the reduction of GHG emissions following the adoption of the Paris Agreement, which proposes the goal of limiting the increase in global temperature to 1.5°C by the end of the century.

Both the public and private sectors have mobilized resources to achieve these climate action goals; according to Buchner et al. (2023), both types of financing sources have allocated a similar number of resources. In the context of the Paris Agreement, public resources play a crucial role in climate finance since the treaty establishes certain commitments from developed countries to provide financial resources to developing countries to reduce emissions and adapt to the effects of climate change. However, the role of the private sector is fundamental for climate action, not only because of its greater efficiency and adaptation to change, but because the magnitude of the challenge far exceeds the capacities of states.

A central element in the context of climate finance is the development of capacities and appropriate regulatory frameworks, especially in developing countries. This is essential so that they can access the funds and manage them effectively, thus guaranteeing a tangible and sustained impact in the fight against climate change.

In this context, this study evaluates the degree of preparation of the financial systems of four CAN countries (CAN-4) to access climate finance. Three phases are proposed to conduct the analysis: In the first, based on the existing literature on climate finance readiness, a set of 37 financial system readiness indicators is defined, expanding the approach proposed by Samuwai & Hills (2018) and Caldwell & Larsen (2021).

¹ The authors express their gratitude to Juan Felipe Franco for his valuable guidance during the execution of the study, to the representatives of the entities who kindly shared their knowledge and perspectives on the topic in the interviews, and especially to Osmel Manzano (Regional Economic Advisor), Leandro Andrian (Lead Regional Economist), and Laura Giles (Country Economist) from the CAN team of the IDB for their valuable comments and suggestions.

These indicators are organized into four categories: (i) financial planning, (ii) access to financing, (iii) execution of financing, and (iv) measurement, reporting and verification (MRV) of climate finance, following the framework proposed by Vanderweerd et al. (2012).

The results of this phase of the study allow us to establish that the countries of the region have made satisfactory progress in the financial planning component, which serves as a basis for access to financing. However, access to resources and their execution are at a medium level of development, with great challenges in the creation of portfolios for projects that can be financed, as well as the need for greater participation from the private sector. Furthermore, there is still work to be done on climate finance MRV systems, in order to inform decision-making and prioritize areas of climate action. Finally, we can detect the strengths of each country in specific areas that emerge as opportunities to strengthen South-South cooperation in the region.

The second phase of the project consists of a characterization of the financial products available for climate finance in each country. Specifically, we elaborate on the presence and typology of green financing products available to the public for each of the four countries, as well as investment and insurance alternatives with these same characteristics. According to the results, financial entities in the region have shown growing interest in green products. Colombia leads the indicators in terms of the number of institutions that offer green financial products, followed by Ecuador and Peru.

Finally, for the Colombia case study, semi-structured interviews were conducted with key stakeholders involved in climate financing. These stakeholders, whose roles are detailed in the questionnaires presented in Annex A, provided valuable insights to complement the findings from the country's first two phases.

The rest of this document is organized as follows. Section 2 establishes the conceptual framework of climate financing. Section 3 provides a general context of the advancements and gaps in climate financing, first at a global level, then at the level of the Latin America and Caribbean region, and finally focusing on the four countries of the CAN. Section 4 presents the results of the analysis of climate change readiness in the four countries and the characterization of green products in each country. The main insights gathered from the study of the interviews are included in Box 1. In the end, the structure of the semi-structured interviews and the details of the indicators of readiness for climate financing, as well as their evaluation for Colombia and Peru, are presented as annexes.

2. Conceptual framework

The term “climate finance” is used to designate all financial flows dedicated to addressing climate change by all public and private actors; this can be seen on a global or local scale and includes international financial flows to developing countries to help them face this great challenge. Furthermore, climate finance as a whole includes actions for both mitigation and adaptation to climate change (IPCC, 2022, p. 1610). It is estimated that in the 2021/2022 biennium, the average annual flow of climate finance was USD 1.27 trillion, a figure that represents close to 1% of global GDP (Buchner et al., 2023).

Flows for climate finance can go through various channels that involve public and private institutions. Public institutions have provided most of the climate finance between 2011 and 2020 (Naran et al., 2022, p. 11). Article 1.1. of the United Nations Framework Convention on Climate Change (UNFCCC) establishes that all participating countries have a shared but differentiated responsibility for the protection of the “climate system for the benefit of present and future generations.” Furthermore, in its Articles 4.3 and 4.4 it stipulates commitments by developed countries to provide financial resources to cover the expenses

incurred by developing countries ascribed to the Convention to protect the climate system and to adapt to the effects of climate change, in case that they are especially vulnerable. Furthermore, Article 11.1 establishes a “mechanism for the provision of financial resources on a subsidy or concessional basis,” especially regarding technology transfer (United Nations, 1992). Between 2011 and 2020, climate finance through concessional resources represented close to 16% of the total; this type of financing is essential as it allows to manage risks related to emerging technologies and markets (Naran et al., 2022, p. 5). However, excessive dependence on these sources can generate demand pressures for public financing, increasing the risk of resource availability (Samaniego and Scheneieder, 2015, p. 20).

In this sense, private financing plays a crucial role and has been gaining strength in the climate finance landscape. In most cases, private financing uses financial mechanisms outside the UNFCCC definition and based on the market. However, its growth is below the scale and speed necessary to transition to a low-carbon economy. While there have been significant commitments from financial institutions in relation to climate change, it is unclear how quickly they will translate into concrete actions (Naran et al., 2022, p. 4). Additionally, financing through private sources may be less effective in countries with inefficient markets and weak regulatory frameworks (Samaniego and Scheneieder, 2015, p. 20).

In view of the above, one of the great tasks consists of building and strengthening national systems so that they are prepared to use climate finance effectively (Vanderweed et al., 2012, p. 4). That is, countries should focus on, or prepare for, an environment that enables investment in order to better position themselves to attract private investors to finance climate change-related projects (Samuwai & Hills, 2018, p. 2). In principle, climate finance readiness would improve the ability of countries to absorb and directly access financial resources without the need for financial intermediaries, so that they can fully participate in international climate finance agreements (The Nature Conservancy, 2012, p. 1).

Despite the importance of preparing for climate finance, there is still no clear conceptual framework for its analysis. In the literature, the way in which its analysis is approached depends on its definition. For example, Vandeweerd et al. (2012, p. 4) define climate finance readiness as the capacity of countries to plan, access, execute and monitor climate finance, so that it is integrated to national development priorities and the achievement of sustainability goals, in order to stimulate financing flows towards climate action. In line with their definition, they consider that preparation has four components:

- » **Financial planning:** which is related to the ability to evaluate the needs and priorities of climate finance, and to identify funding sources.
- » **Access to finance:** This component includes the ability to access finance, mix and combine resources, and formulate climate action programs and projects.
- » **Financing execution:** refers to the ability to implement and execute projects and programs, build capacities, and coordinate their implementation.
- » **Measurement,** reporting and verification of climate finance flows and their impacts on climate, poverty and national development priorities.

In a similar vein, Nakhooda et al. (2013, p.1) suggest that climate finance readiness is defined as the processes that improve the capacity of developing countries to access, allocate, and spend resources effectively. Based on this, they establish that the preparation has three components:

- » **Planning:** the national institutions and processes that allow to plan and program the financing necessary for climate action and its alignment with national strategies; this includes policies, regulations and incentives that affect investment to address climate change.
- » **Aptitude:** skills and capacities related to climate finance; knowledge management to access resources and the ability to develop a portfolio of climate change projects and programs.
- » **Access:** this refers to systems to effectively seek, receive, and spend resources, as well as processes to monitor and evaluate climate finance.

On the other hand, The Nature Conservancy (2012, p. 1) suggests that the term “climate finance readiness” refers to the processes that allow developing countries to prepare to access, allocate, distribute, and use financial resources for action against climate change, including monitoring and reporting results. According to its analysis, The Nature Conservancy proposes that the process of preparing for climate change has five components. The first of them is the planning process, which serves as a framework for the four additional components, these being: the national strategy, the functions of the financial architecture, the form of the financial architecture and the financial mechanisms and vehicles (p. 3). Financial architecture is defined as intersectoral planning and coordination for the allocation of resources for climate action (p. 1).

According to the above, despite some differences in form, it can be observed that the analysis of preparation for climate finance generally considers the same essential components: planning, intersectoral and interinstitutional coordination, knowledge management, building capacities, and monitoring and reporting resources and their use. This work will use the four components established by Vandeweerd et al. (2012) to study the level of preparedness for climate financing of the CAN countries. These four components are, in turn, the categories into which the 37 financial system preparation indicators that are part of the analysis approach proposed in this study were classified.

3. Climate finance context

3.1. Climate finance worldwide

Climate finance, understood as the financing of projects necessary to mitigate and adapt to climate change, is the factor that is essential to achieve the objectives of the UNFCCC. On the one hand, Climate Finance is required for large investments necessary to significantly reduce greenhouse gas (GHG) emissions. On the other hand, large investments are also necessary to adapt to the negative effects and reduce the impact of climate change (UNFCCC, 2023). There is a growing global awareness of the urgency of this issue, given the imperative need to limit global warming to 1.5 degrees similar to that of the pre-industrial era, as established in the Paris Agreement (Naran et al., 2022).

The *Climate Policy Initiative* report (Naran et al., 2022) provides a broad context of global climate finance needs, showing how the 2010s have seen significant growth in climate finance, of both public and private origin, doubling in said period (from 364 to 665 USD billion from 2011 to 2020). However, this growth is insufficient, and it is estimated that investment in climate projects should increase around 7.5 times to achieve the objectives of the Paris Agreement. Specifically, it is necessary to go from annual flows of 850

USD billion in 2021 to around 6.3 trillion by 2030 (average scenario). It is worth noting that this figure, although high, is only 3% of global investment and 2% of liquidity in global financial markets, and, of course, there are great barriers to allowing its deployment (ECLAC, 2023; Naran et al., 2022).

It is also noted that, although climate finance from private sources has grown (4.3% annual average), the growth from public resources has been greater (9.1%). While financial institutions have been committing to carbon-neutral practices and sustainable finance, it is not clear that these commitments are translating into effective investments. On the other hand, although public financing has been fundamental to channel difficult investment sectors (infrastructure, agricultural sector, adaptation), a greater effort is required from governments, both to take more risks and to create regulatory and stimuli frameworks that encourage greater private investment. An example of the latter has been the successful application of incentives to the energy industry in developed countries, which has managed to promote investment in clean energy generation, and significantly reduce installation and generation costs per kWh.

Furthermore, much-needed climate change adaptation measures are severely underfunded. Of a total of USD 653 billion for climate finance globally, between 2019 and 2020, only 10% was dedicated to adaptation or dual benefits (mitigation and adaptation), and therefore the vast majority is dedicated to mitigation projects. On the other hand, most of the financing for adaptation comes from the public sector, although the methodologies for measuring it, and especially those corresponding to the private sector, are poorly developed.

Regarding regional distribution, 75% of climate finance is concentrated in North America, Western Europe, and East Asia & Pacific. Low- and middle-income countries (including CAN) receive only 25% of climate finance flows. It is also highlighted that 76% of global climate finance is domestic, that is, generated and invested in each country. In Latin America and the Caribbean (LAC) the figure is 53%, with the remaining 47% coming from international flows.

3.2. Climate finance in Latin America and the Caribbean

Focusing on LAC, it is important to highlight the high susceptibility of the region to extreme climate events that include mega-droughts, extreme rainfall, heat waves and the loss of glaciers, as shown in the recent UNFCCC report (2023). In the future, the effects of rising sea levels and ocean warming are expected to have an impact on the ways of life of coastal populations, including their income from tourism, and aspects such as health and energy and water security. The effect will be particularly felt in the small nations of Central America and the Caribbean islands. A particularly serious factor for LAC is the loss of productivity associated with heat stress, estimated between 6.7 and 10.6% by 2050; For the countries of the Andean Community, specifically, this loss is estimated between 7 and 9% (ECLAC, 2023, p. 15), which does not include the effects on the economy associated with the effects of extreme climate events. A reduction between 1.3 and 3.3% in GDP per capita is estimated in 2030 and 2050, respectively, relative to a scenario without an increase in global temperature, which could result in an increase of 3.2 million people living below the poverty line. The above suggests clear negative effects on the region's potential growth and highlights the importance of climate change adaptation projects for the region. Despite this, climate finance in LAC, in line with the aforementioned global trend, is particularly focused on mitigation projects: 89% of financing is dedicated to mitigation, while only 8% is allocated to adaptation and the remaining 3% goes to dual benefits (ECLAC, 2023).

On the other hand, the region exhibits a commitment to mitigation, establishing GHG emissions reduction goals for 2030 in its Nationally Determined Contribution (NDC). These commitments, which were recently up-

dated by most LAC countries, incorporate a higher degree of ambition than their initial version, considering the imminence of climate change. This is how the mitigation goals² establish a GHG reduction compared to the base scenario (*“business as usual”*) of between 25% and 61%. In addition, there are sectors that have been identified as in need of both adaptation and mitigation. However, to achieve these NDC goals, the level of decarbonization, which between 2010 and 2019 reached an average rate of 0.9% annually, should be at least 4-5 times higher, and to achieve the goals of the Paris Agreement, 6 -8 times greater. Furthermore, it is estimated that achieving the objectives set out in the NDCs requires an investment between 3.7% to 4.9% of the region's GDP per year until 2030, between 7 to 10 times higher than the investment that occurred in 2020 (0.5% of regional GDP). Now, when it comes to developing countries, a certain tension between growth and decarbonization is evident in the region. In the base scenario, economic growth would have to be between -1.5% and -2.2% to achieve the goals; but if the region's economy grows close to 4%, it will be necessary for decarbonization to increase to at least 3.9% annually (ECLAC, 2023).

The amounts required for climate finance in LAC are estimated between 2.1 and 2.8 thousand billion dollars between 2023 and 2030, which represents between 3.7 to 4.9% of the region's GDP. The part allocated to mitigation is estimated between 2.3 to 3.1% of the region's annual GDP, with the transportation sector being the one that requires the most investment, but it also includes energy systems and reduction of deforestation. The part that corresponds to adaptation is estimated between 1.4 and 1.8% of the region's GDP, and the sectors that demand the most are water and sanitation, flood control, irrigation, and protection of biological diversity (ECLAC, 2023). The challenge of attracting financing for these required investments can be seen when comparing it with foreign direct investment in LAC, which averaged 3.6% of GDP between 2013 and 2022 (World Bank, 2023).

The amount of climate finance in LAC in 2020 reached 22.9 billion dollars, corresponding to only 0.5% of regional GDP. Most of these funds (90%) come from multilateral development banks and green bonds. To meet investment needs, current financing as a percentage of GDP would have to grow between 7 to 10 times.

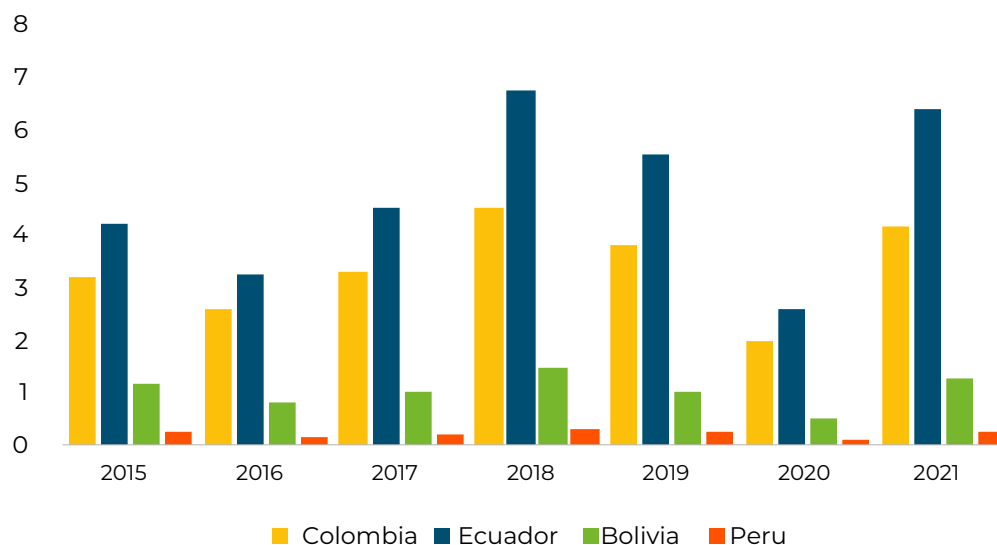
Now, the climate transition represents another important challenge for some LAC countries, which is not contemplated in the latest ECLAC report (2023). To the extent that a good part of their national income depends on the exploitation of fossil fuels (oil, gas, coal), their public finances will be threatened by a gradual global transition to green energy. In this sense, the OECD report (2023) highlights the importance of preventing carbon lock-in, referring to the continued use of fossil fuel infrastructure or assets, even when the possibility exists of replacing them with zero or near-zero emission alternatives. In addition, carbon sequestration also manifests itself in the financing of technologies that make marginal improvements in emissions but are nonetheless emissions-intensive in the long term. This is a particularly high risk in the case of developing economies, and can manifest itself in greenwashing behavior, i.e., when companies that use green labels direct their capital to high-emission activities instead of contributing to the reduction of greenhouse gases.

² Mitigation goals can be set absolutely or relatively. For example, Argentina proposes an absolute goal, applicable to all sectors of the economy, of not exceeding the net emission of 349 million tons of CO₂e in 2030. Meanwhile, Colombia plans to reduce carbon emissions by 51% based on a trend scenario that takes the year 2014 as a reference. On the other hand, the goals may be dependent on obtaining international cooperation resources, or not. Saint Kitts and Nevis proposes a GHG emissions reduction goal of 61% by 2030, compared to the base year 2010, dependent on adequate access to financial and non-financial resources (capacity building).

3.3. Decarbonization in the Andean Community (CAN-4)

CAN-4 countries need to intensify their productive transformation in their commitment to contribute to the global decarbonization agenda. Their production and energy matrix are presented below.

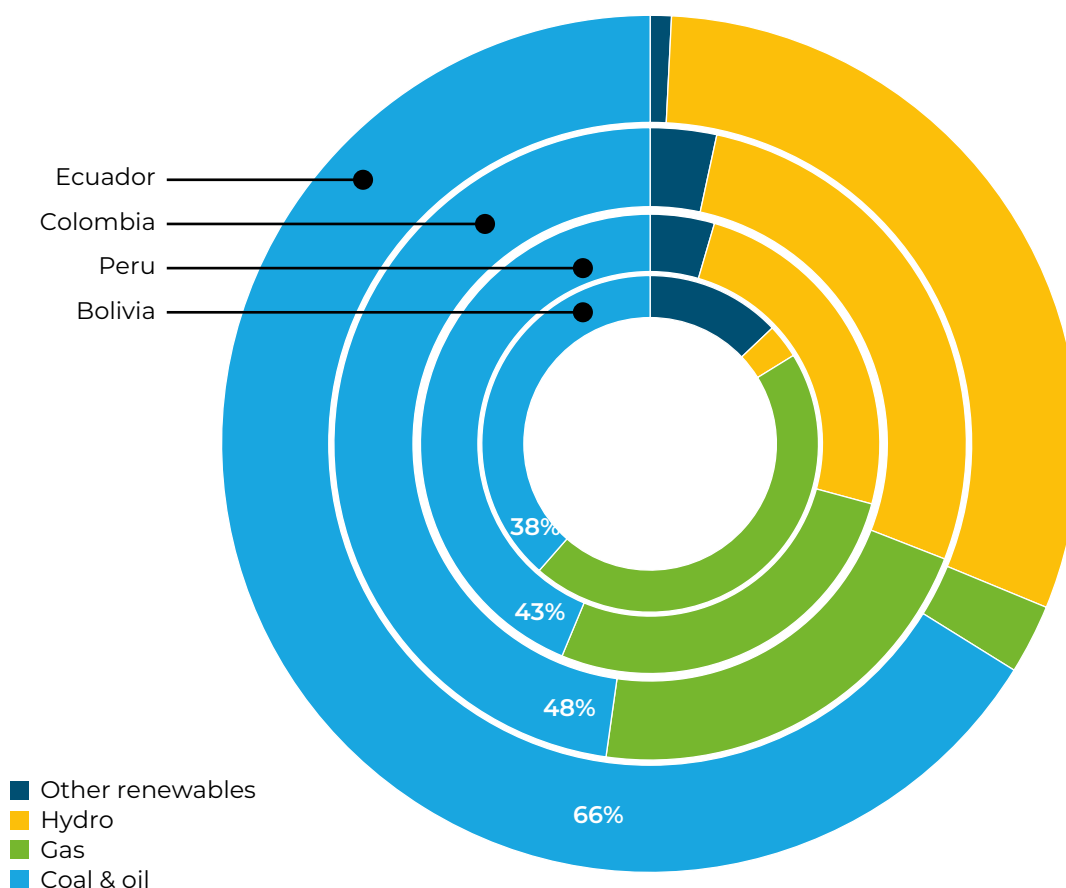
Figure 1. Income from Oil and Coal % of PIB



Source: World Bank (2023)

In the four economies of the CAN-4 region, oil, and coal revenues between 2015 and 2019 averaged 2.8% of GDP, compared to 1.5% of the world average. Furthermore, in 2021, the four CAN countries increased their oil and coal incomes compared to the 2015-2019 average. In Colombia, this figure reached 4.14% of GDP in 2021, while in Ecuador it is 6.4% (see Figure 1). Bolivia depends less on oil and coal revenues and more on revenues from natural gas, another source of fossil energy.

For its part, the CAN-4 energy matrix also presents a discouraging outlook. In the median of the four countries, oil and coal account for 46% of their energy consumption; in countries like Ecuador, this figure reaches 66% (see Figure 2). Biomass and other unconventional forms of renewable energy, such as solar and wind, still account for less than 5% of energy use, except in Bolivia (13%).

Figure 2. Energy matrix of CAN countries in 2022: Energy consumption by source

Source: Statistical Review of World Energy, The Energy Institute

CAN countries have made some progress in designing frameworks to promote energy and production transitions (hereinafter, green transitions) and help close their financial gap. In Colombia, for example, there is an energy transition policy (CONPES – [National Council of Economic and Social Policy] 4075 of 2022), which seeks to allocate close to USD 78 million between 2022 and 2028, with the expectation of generating a catalytic effect through public-private investment initiatives (CONPES, 2022). In Ecuador, the government, together with the IDB, has developed an energy transition plan for the Galapagos Islands, which contemplates the replacement of fossil fuels with non-conventional renewable energy sources and the development of energy efficiency programs, among others (Ministry of Energy and Mines, 2023).

The aforementioned efforts are part of a wide range of initiatives that countries in the region have undertaken with the aim of adequately preparing for climate finance and strengthening their climate action policies. As we will explore later, certain regulatory and legal frameworks have been established that provide essential guidelines and tools for the effective management of climate action in the CAN. Colombia has a National Climate Finance Strategy, which is part of the planning and management initiative of the National Climate Change Policy and the National Climate Change System. Within this system, a Financial Management Committee has been created, responsible for monitoring the needs and sources of financing and proposing new policies and financial instruments to promote climate finance. Ecuador has a National

Climate Change Strategy and a National Climate Change Financing Strategy, while in Peru, the National Climate Change Strategy (ENCC 2050) is the main instrument for climate change management, and Bolivia updated its Plurinational Climate Change Policy in 2023 to face the climate crisis from all spheres of the State. These institutional frameworks and agreements have resulted in the deployment of resources for climate change initiatives, channeling a fraction of the available international funds to finance the energy transition and low-emission production projects.

In the area of monetary resource mobilization, financial institutions have played an increasingly active role in developing credit and investment products specifically designed to promote the flow of capital towards climate action initiatives. In addition, notable progress has been observed through the participation of private and sovereign issuers in thematic bond markets, which have become an essential mechanism on a global level to integrate the private sector in financing efforts aimed at combating climate change. In total, between 2014 and 2022, the four countries have been able to raise approximately \$1.6 billion in this type of debt. Sovereigns have been active in the GSS ("Green, Social and Sustainable") debt landscape and, in some cases, have led the way: Colombia has presented a total of four green bond deals, totaling \$550 million, while the Peruvian sovereign has made two sustainable bond issues - which combine ecological and social benefits - for a total of USD 4.4 billion. Colombia's 2021 sovereign green bond (the first bond issued in local currency in the region) aimed to finance a portfolio of 27 expenditures, of which 44% were for clean transportation, non-conventional energy sources and efficiency, circular economy, and low-emission agriculture (Dagnino Contreras et al., 2023). In Ecuador, leadership comes primarily from the private sector: between 2019 and 2021, six banks were able to raise a total of USD 720 million from various international and multilateral sources to allocate them to sustainable business projects in agriculture, housing, and transportation, as well as energy efficiency and waste management (Vidal & Endo, 2022).

Despite the progress made so far in some aspects of climate finance, the financial systems of CAN countries still have a long way to go in their goal of closing the green transition gap. For policymakers and industry to outline a roadmap, a proper assessment of the readiness of financial systems is necessary - in the sense of Vandeweerd et al. (2012), as capacities for accessing, delivering, monitoring, and reporting on climate finance. In particular, assessing the capacity of markets and institutions (especially banks of different levels) to efficiently allocate capital towards successful transition projects is essential, especially in the post-pandemic context, given that the financial system in the CAN region faces increasing default rates combined with the implementation of Basel III regulations (see, for example, Mejía and Andrian, 2022).

In summary and for the purposes of this document we can highlight the following points:

- » The global commitment to face climate change requires a significant mobilization of financial resources, which has not yet materialized at the rate required to achieve the goal of not exceeding 1.5 degrees above pre-industrial levels, as agreed in the Paris agreement. It is estimated that capital flows of around 7.5 times greater are required.
- » Most resources worldwide for climate finance come from public funds (50.6%), although with a growing participation of private funds (Buchner et al. (2023)). Furthermore, measures for climate adaptation to climate change are more underfunded than those for mitigation. In this sense, governments are required to invest more, take more risks, and generate regulatory and stimulus frameworks that catalyze greater private investment.

- » Two pieces of information highlight the insufficient mobilization of international resources for climate financing in the LAC and CAN countries. On the one hand, low- and middle-income countries globally receive only 25% of climate finance flows. On the other hand, while 47% of LAC funds come from international flows, considering the stage of development of the countries in the region, it is essential to consolidate this source of financing.
- » Latin America and the Caribbean have high exposure to climate change, due to exposure to extreme events, the effects of rising sea levels, as well as the loss of productivity associated with heat stress. It is estimated that, if this continues, climate change will translate into a loss of GDP per capita for the region between 1.3 and 3.3% by 2050.
- » Although the region shows a commitment to mitigation, with demanding emissions reduction goals (NDCs), achieving them requires a level of decarbonization 4.5 times greater than that of recent years. In addition, the trade-off between growth and decarbonization is highlighted: the greater the economic growth, the higher the level of decarbonization required to achieve these goals.
- » The mobilization of resources for mitigation in LAC is insufficient to meet GHG emissions commitments. There was a total of 0.5% of GDP in 2020, against a requirement between 3.7 to 4.9% of GDP. Most of these funds come from multilateral development banks and green bond issues. To highlight the magnitude of the gap, keep in mind that FDI in the region was 3.6% in recent years.
- » For the four CAN countries, the energy transition represents a great additional challenge, due to their high dependence on oil and coal in their energy matrices. Although some countries have structured energy transition plans (see, for example, Colombia's CONPES 4075), the dependence of national income on fossil fuels, especially in Ecuador and Colombia, implies a high risk of carbon sequestration in such countries. Therefore, climate finance is crucial to consolidate the energy transition in the region.
- » CAN-4 countries have made progress in some aspects of climate finance, from the creation of institutional bases and regulatory frameworks to the issuance of green bonds in countries such as Peru and Colombia. Despite these advances, the four countries still have much to do. An assessment of the capacity of the state architecture and financial systems to efficiently mobilize and allocate capital to energy transition projects is required as a prior condition.

4. Preparation for climate finance in CAN-4 countries

4.1. Preparation indicators

Climate finance readiness for Andean countries was measured according to a set of 37 indicators chosen for the purposes of this study. These indicators were based on the work of Samuwai & Hills (2018) for the Asia-Pacific region and that of Caldwell & Larsen (2021) on access to the Green Climate Fund, with modifications to adapt the indicators to the Latin American, and more precisely, Andean context.

The selected indicators were grouped into four categories and eight subcategories, as shown in Table 1. This classification allows us to establish which areas of work should be prioritized in each country, in light of the information available, in order to advance in preparing for climate finance in the region. The averages obtained from the scores of the indicators of a subcategory or category allow us to make comparisons between countries.

Table 1. Final selection of categories and subcategories of preparation indicators for climate finance.

Category	Subcategory	Number of indicators
1. Financial planning		12
	Assessment and planning	6
	Coordination and institutions	4
	Knowledge management	2
2. Access to financing		15
	Institutional and funding mechanisms	10
	Access to Green Climate Fund (GCF)	5
3. Financing execution		6
	Knowledge dissemination and capacity building	5
	Stakeholder engagement and collaboration	1
4. Measurement, Reporting and Verification of climate finance		4
	MRV	4
Total		37

Source: In-house preparation

Each of the indicators used was assigned a numerical score on a scale between 0 and 3, in which a score of 0 corresponds to the lowest possible performance, and 3 to the highest. Some indicators are dichotomous, and can only take extreme values, 0 or 3. In other indicators, it is possible to obtain 1 or 2 points when, in the opinion of the evaluators, there is an intermediate rating. Table 2 explains how the different indicators were evaluated according to the methodology used for their calculation and Annex B shows the indicators in detail.

The score assigned to each indicator was derived from a review process of official documents from public and multilateral entities related to climate finance in each country, including national climate finance and

climate change strategies and policies, databases of entities responsible for monitoring these resources, web pages and reports from international funds for financing adaptation and mitigation projects, among others. Using an internal comparison criterion between the results of the countries of the Andean Area made it possible to determine the score of each country for the indicators on a scale from 0 to 3.

Table 2. Final selection of categories and subcategories of preparation indicators for climate finance.

Methodology of the indicator	Quantity of indicators	Number of each indicator (Annex B)	Measurement scale
Existence (dichotomous)	5	22, 23, 30, 31, 32	The indicator assesses the existence of an element and scores three if such element exists, or zero if it does not exist.
Existence and update	22	1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 21, 24, 26, 27, 28, 29, 34, 35, 36, 37	The indicator simultaneously evaluates the existence of an element and whether it is updated or not, allowing intermediate score levels between zero and three.
Specific quantitative	10	13, 14, 15, 16, 17, 18, 19, 20, 25, 33	It evaluates a country's performance based on the quantity of an element, compared to the quantities of other regional peers, taking these quantities to a scale of zero to three.

Source: In-house preparation.

The score of these aggregations was constructed through the arithmetic average of the scores of the indicators belonging to each subcategory or category. This, without performing additional estimations, so that all indicators have the same weight in the score of the subcategory or category in which they are found. For this reason, the scores for each subcategory and category vary between zero and three depending on the country's performance.

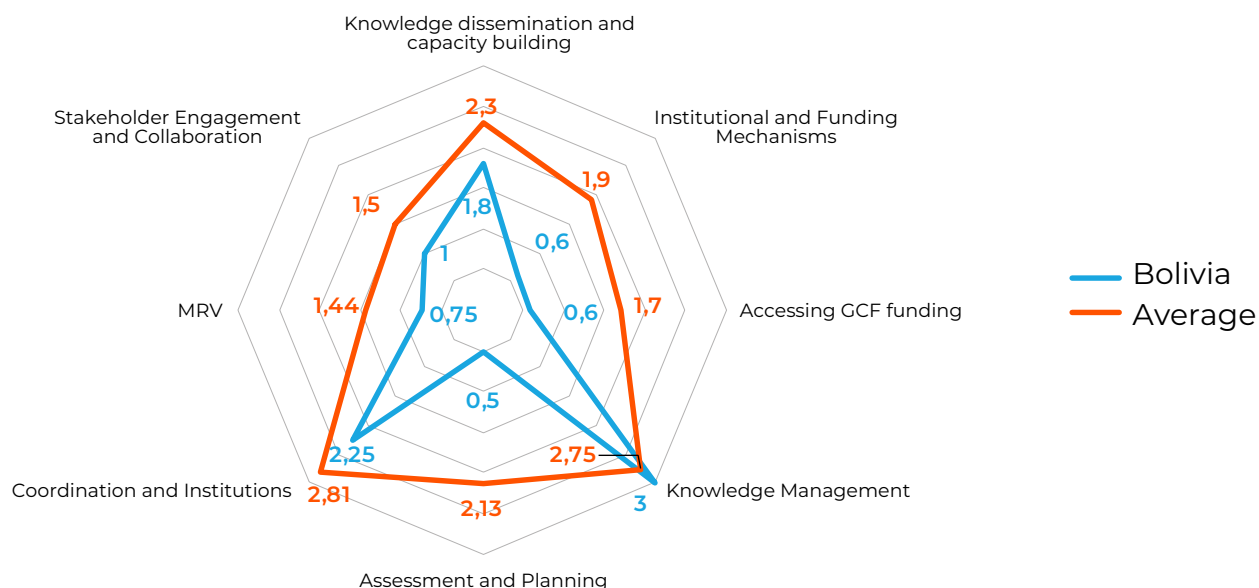
Before presenting the results by country, it is necessary to indicate two limitations of the methodology proposed here. First, this rating is essentially a comparison of performance in financial readiness for decarbonization among CAN-4 countries. The minimum and maximum scores are awarded based on the performance of each country in relation to its peers in the same region, so the performance of third countries outside CAN-4 is not taken into account as references for this evaluation. Secondly, it is an assessment in terms of the minimum preparation for climate finance in terms of policies, institutions, and relationships. These are necessary requirements, but not sufficient, to achieve results in terms of mitigation or adaptation. In this sense, it is not an evaluation of the execution of projects or the obtaining of results.

The information below details the score obtained by each country, with each figure illustrating the averages by subcategory in comparison with the CAN-4 average.

4.1.1. Bolivia

Bolivia stands out for being a country that demonstrates adequate management of knowledge about climate change, its effects and risks in the national territory. It also presents strengths in areas such as institutional coordination, with the early adoption of a legal framework on climate change, the creation of entities in charge of climate finance and climate change management, and the vigilance and reporting on the impacts of climate change. However, it performs particularly poorly when compared to the rest of the region in the categories of access to GFC funds, Institutional and Funding Mechanisms, and Evaluation and Planning. Figure 3 illustrates this performance.

Figure 3. Average score per subcategory for Bolivia



Source: In-house preparation

Note: Each of the vertices in the figure represents one of the climate finance readiness subcategories listed in Table 1. The further a country's score in a subcategory is from the point of origin (zero), and the closer it is to the edge of the figure, it means that the country has a better performance in said subcategory.

There was an additional challenge in the evaluation of several indicators, in relation to the other countries studied, due to the lower level of digitalization of the Bolivian government, which made it difficult to search for the necessary information. This may negatively impact Bolivia's score in several subcategories, without necessarily implying that Bolivia has not advanced in them.

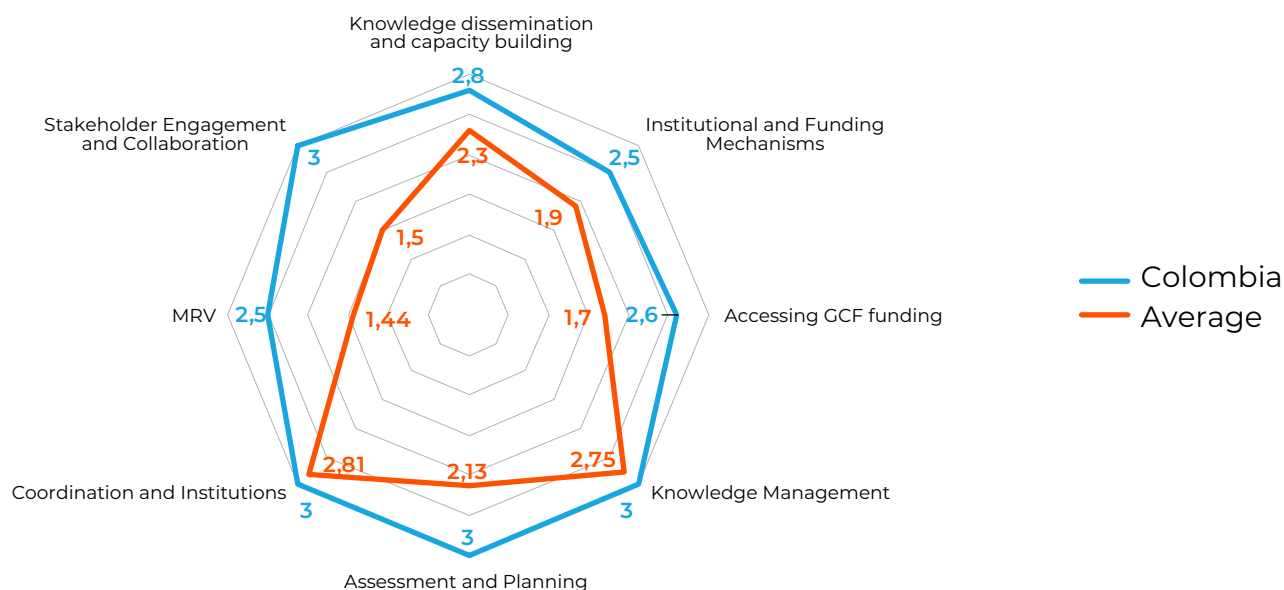
Furthermore, it is necessary to highlight that, over the last decades, the public policy of the Bolivian state regarding climate finance has differed significantly from those of other countries in the region and the main multilateral entities, which partly explains the lower score in certain indicators of this evaluation. For example, the creation of the Plurinational Mother Earth Authority and the Plurinational Mother Earth Fund administered by it, occur within the framework of substantial differences in principles and priorities of the Bolivian authorities regarding mechanisms such as REDD, carbon markets and private sector participation in climate change mitigation and adaptation efforts.

The areas for improvement include the lack of a climate finance strategy, the lack of costing of the NDC (or at least the lack of a document available to the public that documents these costs and how their implementation will be carried out), and project documentation and key programs for mitigation and adaptation. The reporting of greenhouse gas emissions through the national statistics agency can also be improved.

4.1.2. Colombia

Colombia stands out among the countries in the region for surpassing the average in all the subcategories analyzed, as seen in Figure 4. In fact, the country is potentially a reference framework for the other countries in multiple indicators considered for this measurement.

Figure 4. Average score per subcategory for Colombia



Source: In-house preparation

Note: Each of the vertices in the figure represents one of the climate finance readiness subcategories listed in Table 1. The further a country's score in a subcategory is from the point of origin (zero), and the closer it is to the edge of the figure, it means that the country has a better performance in said subcategory.

The relevant positive aspects include the broad participation of private and civil society organizations in entities such as the SISCLIMA Financial Committee, which reflects good coordination between private, public and society efforts. Furthermore, the country has managed to create an institutional infrastructure around climate finance that includes the participation of government entities and ministries with clear and defined functions and has various standards that provide incentives and regulations to the market to favor productive transformations that contribute to mitigation or adaptation to climate change. The Colombian government has assumed an active planning role, evidenced in the National Climate Finance Strategy, as well as in the clarity of the financial requirements to finance the NDC, the GHG emissions statistics reporting system by the national statistics department, DANE, and the linking of the programs and projects developed with the country's vulnerabilities to climate change.

In the Colombian case, the relatively lower score of the climate finance MRV compared to its other subcategories is explained by the fact that the MRV system documents the financial aspect of the projects but does not integrate the environmental impact of the resources allocated to them. Although the RENARE

(National Registry for the Reduction of Greenhouse Gas Emissions) documents the environmental impact of mitigation initiatives that seek to qualify for results-based payments (Ministry of Environment and Sustainable Development, s.f.), it is not integrated to the scope of the MRV of the National Department of Planning (DNP), and its portal is not currently available to the public.

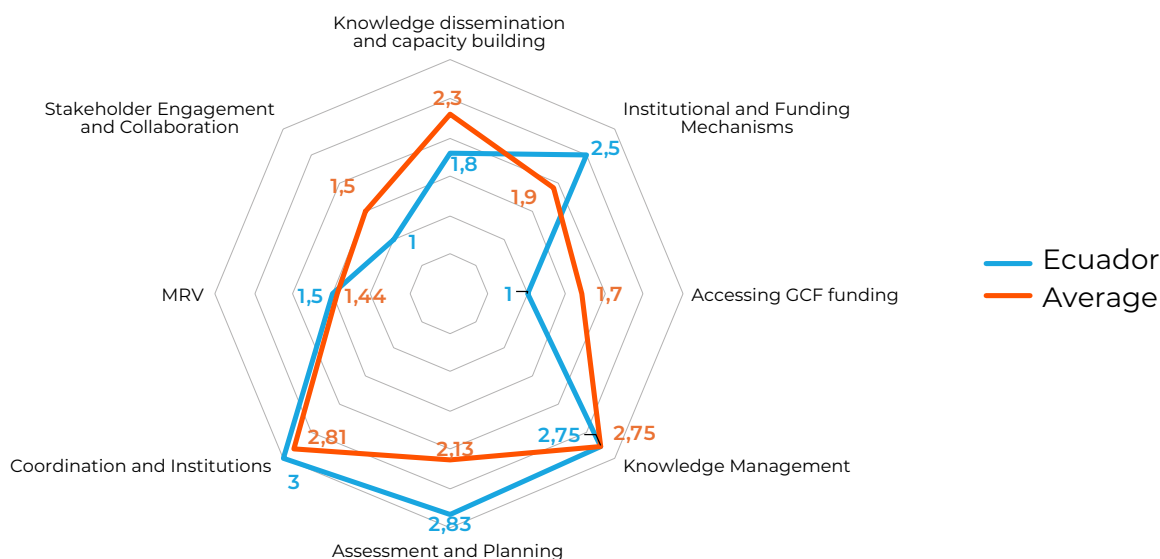
In Colombia, the Institutional and Funding Mechanisms subcategory obtains a low score in relation to the averages of other subcategories because, in terms of incentives and compliance with the law, the country has a less developed legal framework compared to other nations (although it is well located among the countries of the Andean region). Additionally, this subcategory is affected by the insufficient number of resources mobilized compared to the requirements identified by the country.

Now, as stated previously, Colombia's good general performance in this evaluation is the result of its implementation of preparation measures for financing mitigation and adaptation to climate change, which in a good number of assessments exceeds those implemented by other countries of the Andean Region. However, this does not mean that the country does not have important opportunities for improvement.

4.1.3. Ecuador

Ecuador's results, illustrated in Figure 5, contrast favorably with the regional average in most subcategories, particularly the results obtained in the Coordination and Institutions and Knowledge Management subcategories. Firstly, there is an evident established institutional infrastructure, with defined roles for different government agents in areas such as mitigation, adaptation and capacity building from national climate change and climate finance strategies. These agents are brought together through the Interinstitutional Committee on Climate Change, which is responsible for specifying the country's programs and projects and articulating the dialogue with donors through the Climate Finance Working Group.

Figure 5. Average score per subcategory for Ecuador



Source: In-house preparation

Note: Each of the vertices in the figure represents one of the climate finance readiness subcategories listed in Table 1. The further a country's score in a subcategory is from the point of origin (zero), and the closer it is to the edge of the figure, it means that the country has a better performance in said subcategory.

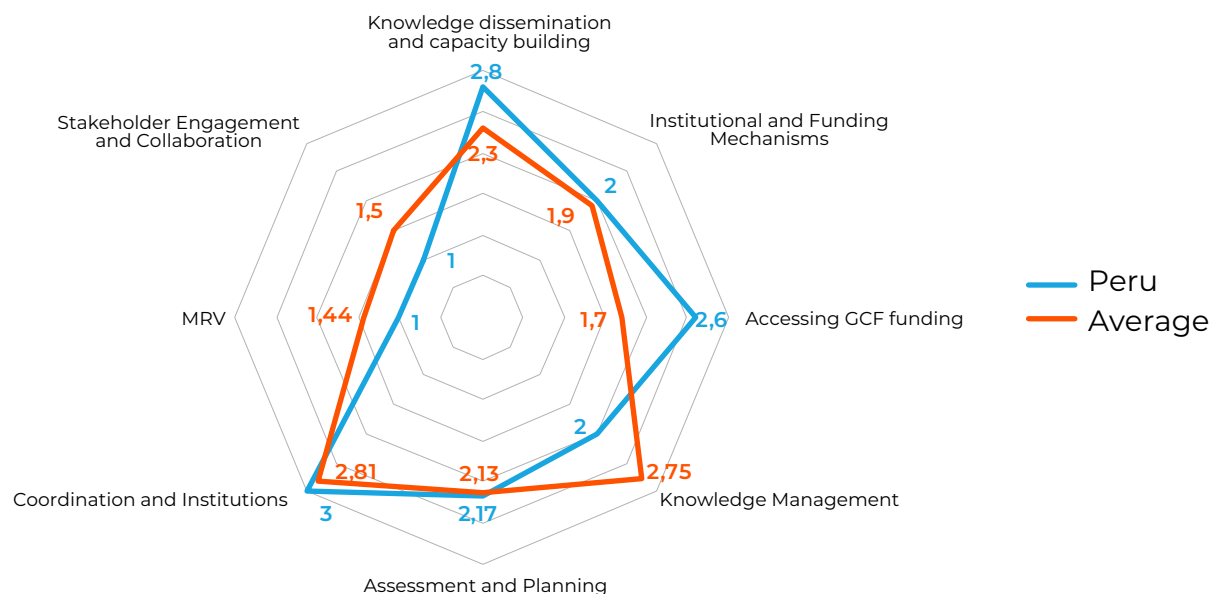
Ecuador also recognizes the linking of scientific evidence on the country's impacts and vulnerabilities to the projects and programs prioritized in national strategies. In addition, there is evidence of the implementation of specialized financial instruments in the country such as green bonds, blue bonds with compliance incentives, public debt swaps for the provision of environmental services, among other innovative measures.

The challenges that the country faces include, first, articulating public and private action, although there are good initiatives in this aspect such as the Sustainable Environmental Investment Fund. Second, the accessibility to the MRV of climate finance must be improved for the general public, as well as the linking of national entities to multilateral funds to facilitate receiving resources from the latter.

4.1.4. Perú

As seen in Figure 6, Peru surpasses the region average in five of the eight subcategories, mainly those that correspond to institutional development from the State. Like Colombia, coordination between institutions in Peru is led by the Ministry of the Environment and a commission with other state, private and civil society actors called the National Commission on Climate Change. The coordination that this commission has with the country's subnational entities through regional commissions is outstanding.

Figure 6. Average score per subcategory for Perú



Source: In-house preparation

Note: Each of the vertices in the figure represents one of the climate finance readiness subcategories listed in Table 1. The further a country's score in a subcategory is from the point of origin (zero), and the closer it is to the edge of the figure, it means that the country has a better performance in said subcategory.

The receipt of financing for different private fund activities such as Profonampe from multilateral funds such as the Green Climate Fund, the Adaptation Fund, among others, highlights the coordination of investors and national authorities with multilateral entities.

Another strength of Peru has been the formation of networks with civil society through awareness campaigns and specialized training, as well as with regional territorial authorities and technical organizations such as the country's hydrology and meteorology service.

For Peru, the low score in the MRV subcategory of climate finance is due to the fact that the information presented is not yet complete. Peruvian authorities indicate that the platform is currently under construction, although the Peruvian web portal for the MRV has information on environmental impacts, measured in reduced CO₂ emissions. However, there are no detailed methodological guides available to the public and the data on private and international investment are not presented in a complete manner, which means that it is easier to find information on national public financing than on resources provided by external agents.

On the other hand, the Relationship and Collaboration with Stakeholders subcategory has a relatively lower score, since publicly available information suggests less participation of the Peruvian private sector in joint decision-making with the government. Despite this, the incorporation of representation from the private sector and civil society to the National Commission on Climate Change stands out as a step to increase this participation. In the Peruvian case, there are official announcements about developments for multiple indicators, the result of which is not achieved in the stipulated time, which may show a lack of continuity in the policies of successive administrations.

4.1.5. Conclusions from the macro-institutional level

Readiness for climate finance in Andean countries was assessed using 37 indicators selected for this study, based on previous work, and adapted to the Andean context. These indicators were grouped into four main categories: financial planning, access to financing, financing execution and monitoring, reporting and verification of climate finance. Scores were assigned to each indicator based on the review of official documents related to climate finance in each country, thus determining its performance on a scale from 0 to 3. Through the arithmetic average of the scores, the category and subcategory scores were constructed, without additional estimations.

It is important to point out two limitations of this methodology: first, it focuses on the comparison of performance between Andean countries and does not consider the performance of external countries; second, it evaluates the minimum preparation in terms of policies, institutions, and relationships, without addressing the level of project execution or the degree of progress in obtaining results in terms of mitigation or adaptation to climate change.

Overall, the evaluation results for the four countries can be summarized as follows: Bolivia demonstrates progress in managing knowledge on climate change and early adoption of legal frameworks but faces challenges in accessing climate funds and financial planning. We found that less government digitalization makes information collection more difficult. Furthermore, the approach to environmental public policies in Bolivia presents fundamental differences with those of other countries in the region, and in general with internationally accepted practices. For its part, Colombia stands out for its institutional infrastructure and private participation, although its incentive programs, and in general its relationship and collaboration with interest groups, have significant room for improvement. Ecuador surpasses the regional average in institutional coordination and knowledge management but needs to strengthen public-private collaboration and improve the accessibility of environmental monitoring. Peru shows strengths in institutional development and coordination with civil society but requires greater participation of the private sector in decision-making. Finally, a weakness common to all countries refers to the accessibility and completeness of their climate finance Measurement, Reporting and Verification systems.

In summary, the four CAN countries have areas of pending improvement, but also strengths in different aspects. These strengths offer the possibility of the transfer of specific knowledge, where each country can transmit its experiences and successful practices to others. This represents a significant opportunity

to foster south-south cooperation between CAN countries, where there appears to be considerable room for improvement. For example, as of 2022, Colombia only registered one project with Bolivia and one with Peru related to biodiversity and the environment, but there were no records for Ecuador (Ministry of Foreign Affairs, Colombia, 2022). The conclusions of this section show the areas in which such cooperation could occur.

4.2. The financial system and decarbonization

The financial system plays a crucial role in the allocation of resources in any economy, and in the case of climate finance, its role is no less important. It is estimated that, in 2021, the green economy represented 7.1% of global stock markets (Ortiz et al., 2022, p. 25). In recent years, the financial industry worldwide has presented initiatives that are in line with the climate urgency. The banking sector, for example, plays a fundamental role in the transition to a low-carbon economy, since its role as financier gives it some control over the allocation of capital for defined objectives (Rachmaninov et al. 2023, p. 1).

Additionally, there are risks and opportunities for financial institutions arising from climate change. For example, there is a financial risk derived from concentrated exposures to climate risks, whether physical or transitional, that can significantly affect the stability of financial institutions (Emambakhsh et al., 2022) and, therefore, the stability of the financial system in general (Dikau & Volz, 2018, p. 3). On the other hand, Ortiz et al. (2022, pp. 13-14) document some of the opportunities that arise because of climate change, such as the possibility of increasing market participation, attracting new customers and developing products and services that allow expanding the portfolio in relation to green products and digital finance. In this sense, this section reviews the progress of the financial systems of the four CAN-4 countries in products for climate finance.

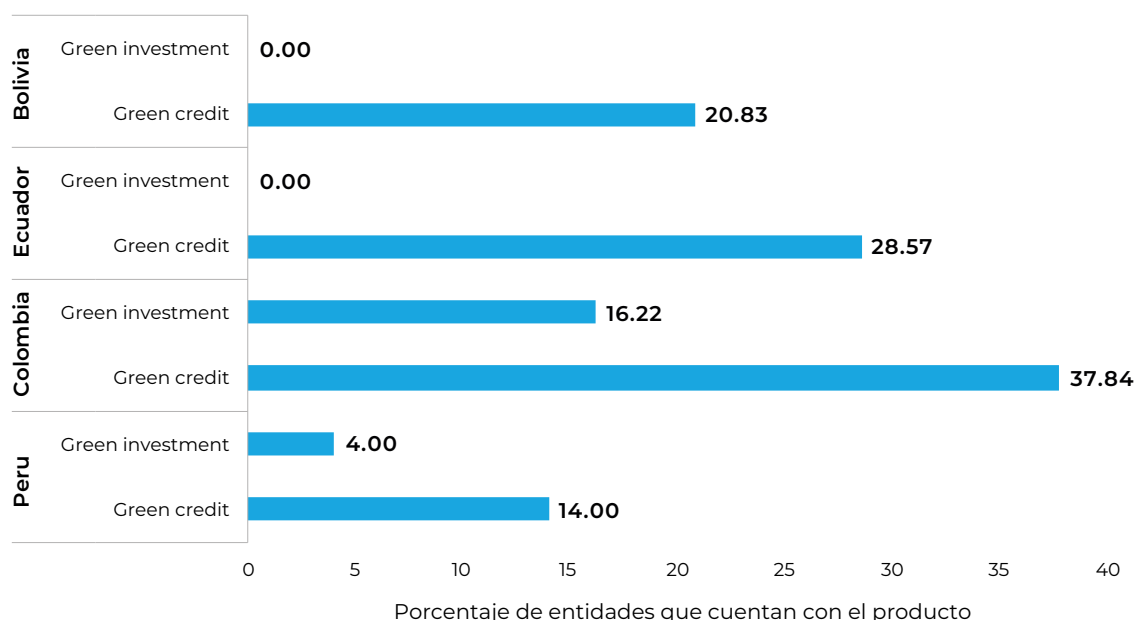
To conduct this analysis, in the initial part of this study we started from the CCADI study (2022) which documents the green financial products available for Colombia and Peru as an inventory. With this as the starting point, criteria were defined to evaluate the green product portfolio of the four countries. A search was carried out for investment and credit products with environmental sustainability criteria in relation to climate change in different entities of the financial sector of the CAN-4 countries. In total, the search included 139 entities, of which 50 are located in Peru, 37 in Colombia, 28 in Ecuador and 24 in Bolivia.

Figure 7 shows the percentage of companies in the financial sector within the total of each country that offer green credit or investment products. Green credit products included lines of credit offered from different segments (for example, mortgage, vehicle or capital investment) that had in common requirements for environmental sustainability criteria, or requirements oriented towards the acquisition of assets considered sustainable, or requirements for the development of sustainable productive projects, with the possibility of reducing carbon dioxide emissions from companies or homes. Similarly, the only investment products taken into consideration were those that allow investing in companies and projects that meet specific environmental sustainability criteria, including bonds, investment funds, or parametric insurance.

The main findings about the product offering for each country are summarized below in general terms:

- » In Colombia, the institutions included in the search were: commercial banks, cooperatives, development banks and insurance companies. Of the 37 entities, green credit was found in 14 (38%) and green investment products in 6 (16%).

Figure 7. Percentage of entities that offer green financial products in the Andean Community, by country



Source: In-house preparation.

- » In Peru, the financial institutions included: banking companies, state financial entities, financial companies, credit companies and municipal savings and credit banks. Of the 50 entities, 7 (14%) have green credit products, and 2 (4%) have green investment products. It is worth mentioning that Peruvian financial entities have developed several parametric insurance policies related to climate events in the last decade.
- » The 28 entities identified in Ecuador are private banks, public institutions, and the development bank. 8 of these companies (31%) have green credit, and there are no green investment products.
- » The Bolivian entities included multiple banks, SME banks, development financial institutions and State financial entities. Only 5 (20.8%) of the 24 entities have green credit lines, and there are no green investment products either.

On the other hand, it was found that green financial products were offered by both the public sector and the private sector in the four CAN-4 countries. The information summarized in Table 3 shows that, for all these nations, the private sector has a greater range of products than the public sector, within which there is a predominance of offers of loans of this type by development banks. Credit also predominates in the private sector, but green investment products are found in Peru and Colombia, countries in which, as already mentioned, insurance products of this type are also offered.

The green financial products identified in this study are designed to promote specific themes, oriented towards objectives such as improving the efficiency and transformation of the energy matrix, optimizing the use of water, building, and acquiring sustainable homes, promoting clean production, and supporting sustainable transportation and agriculture.

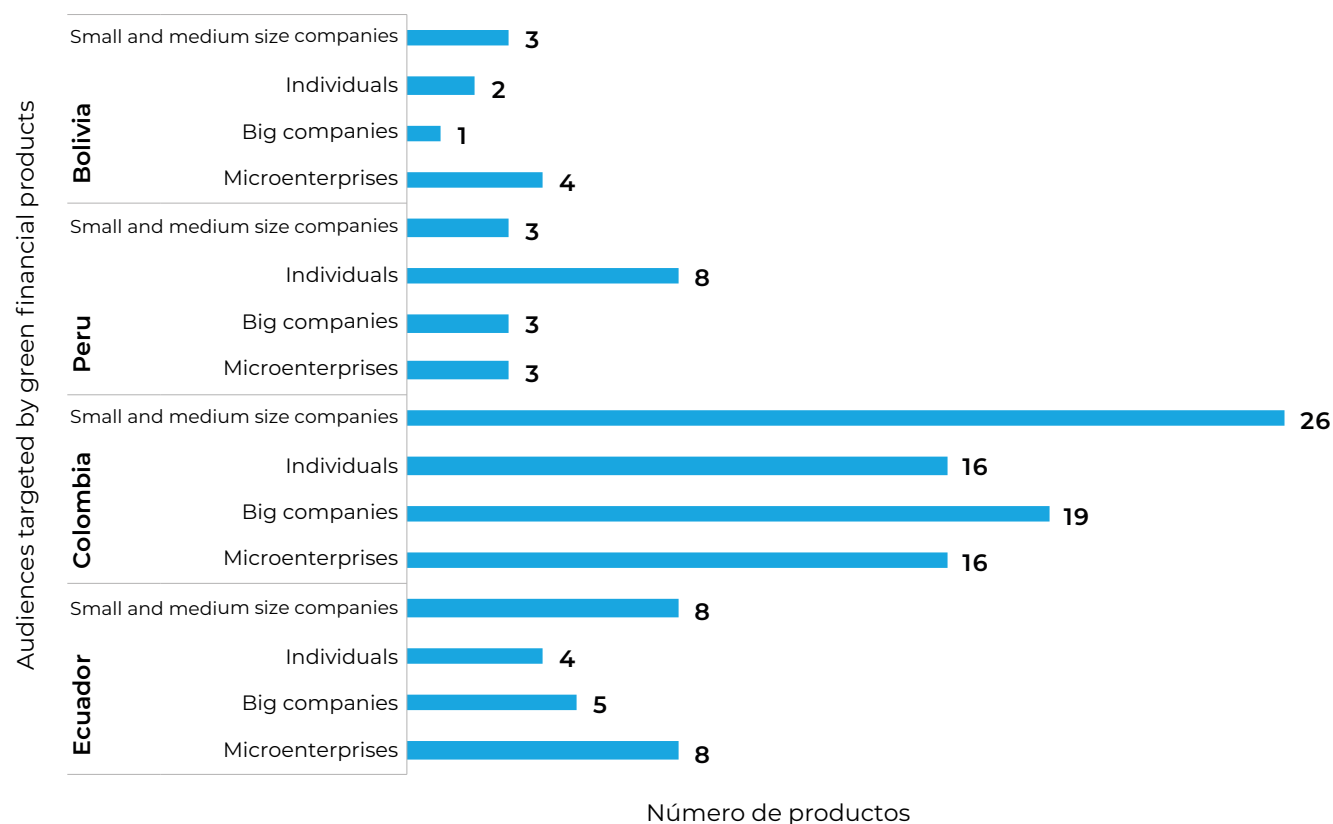
Table 3. Number of entities that offer green financial products, by sector

Country	Public sector	Private sector
Bolivia	2	3
Colombia	4	11
Ecuador	1	8
Perú	2	6

Source: In-house preparation, partially from information from the National Planning Department (2022).

Note: For mixed companies, their products were taken into account within the public sector if the State has a majority in its shareholding composition.

A particularity of these financial products is their focus on different target audiences, which facilitates the development of sustainable activities in both companies and homes. For example, it has been identified that, in most countries, microenterprises represent the main recipient of a wide range of these financial solutions. However, there are notable variations between countries. Peru, for example, stands out for having an abundant supply of green financial products aimed at individuals, which contrasts with a lower availability of options for microenterprises. This diversity is clearly illustrated in Figure 8, which compares target audiences in different national contexts.

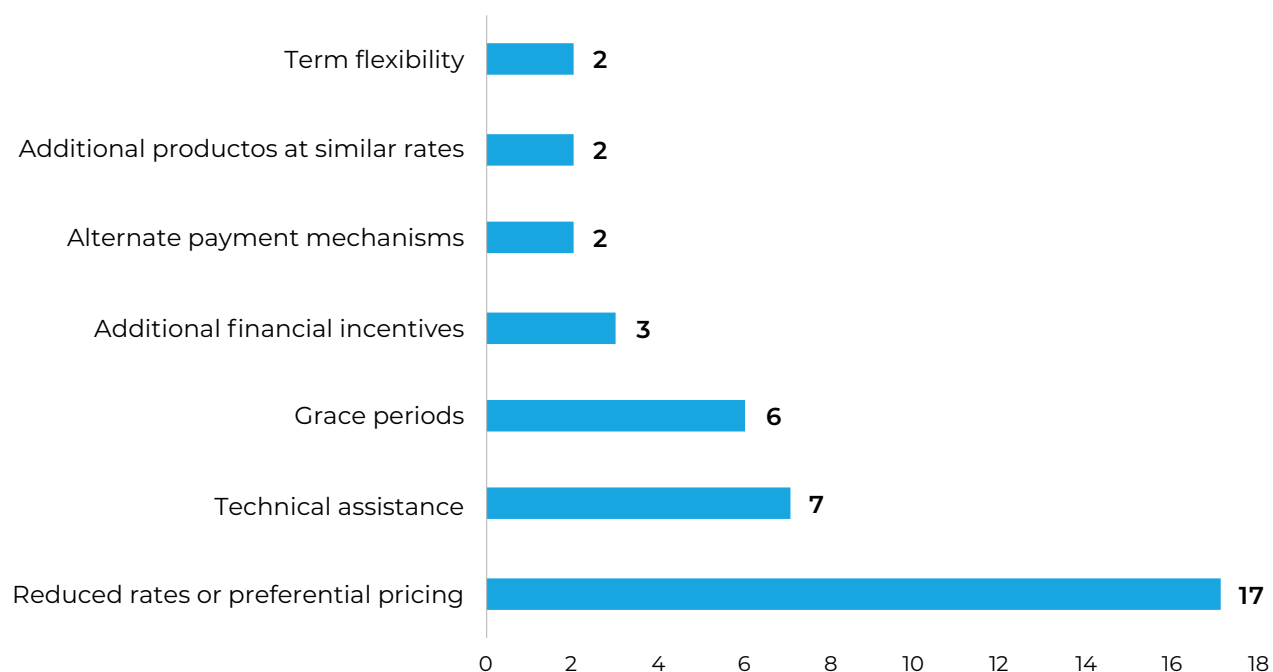
Figure 8. Audiences targeted by green financial products

Source: In-house preparation, partially from information from the National Planning Department (2022)

Colombia and Ecuador also differ in the extensive use of green bonds as a financing mechanism for these sustainable credit products, which has been used in both countries by state and private entities. This strategy has not been widely adopted in Peru or Bolivia (although the Peruvian development bank has issued green bonds on two occasions). These bonds are issued with the specific purpose of raising funds to finance green projects or activities, evidencing an innovative approach in structuring financial products that support environmental sustainability.

Green financial products offered by financial entities are expected to have differential conditions and preferential rates with respect to similar traditional products. However, this was not evident in all cases, as illustrated by some Ecuadorian and Peruvian entities, where it was found that, despite the advertising of better financial conditions than those of other products, the rates were equal to or higher than conventional credits. On other occasions there was no mention of a preferential rate, even though they were evident in some entities. With respect to the differential conditions, some stand out, such as longer grace periods, longer timeframes for the payment of the loan, and the offer of additional products and services to those who acquire the green financial product (such as discounts on other loans, easy payment plans and additional bonuses). There are also benefits in education: in Peru and Bolivia there are credit products that offer additional training or advice on sustainability issues. Figure 9 summarizes some of the main incentives and additional services found in the offer of green financial products in the Andean Area.

Figure 9. Financial products with incentives and additional services



Source: In-house preparation, partially from information from the National Planning Department (2022).

Note: In some concepts, such as preferential rates, their volatility and the updating frequency of the websites of financial institutions make it difficult to verify these incentives. For example, sometimes it is difficult to verify whether the interest rates that are announced as preferential are, in fact, lower than rates for similar products in the same entity.

Just as there are benefits, this type of product also requires additional requirements than those of a traditional product, something that is relevant especially in credit products. Some of these requirements include sustainability certification (EDGE or Leed) for housing financing, or technical and vehicle age requirements for loans related to sustainable transportation. In addition to criteria strictly related to environmental issues, products are sometimes offered to clients who have certain characteristics, such as residing in certain specific regions, having purchased insurance policies, or being engaged in specific economic activities, particularly those related to agriculture and transportation. In terms of gender, three Ecuadorian entities offered differential approaches in the allocation of green products.

In conclusion, although the financial sector of Peru, Colombia, Ecuador, and Bolivia has shown growing interest in green credit lines and investment, there are differences in the offer of these products between these countries. While 15 Colombian entities offer green products, only 9 Ecuadorian entities do so, and merely 8 Peruvian, which shows that there is still ample room to expand the portfolio of sustainable products in these countries. There is a common approach in the themes on which the products focus, such as energy efficiency, water management and sustainability at home. However, the preferential conditions and additional requirements associated with these products are not yet standardized.

It is of utmost importance to move towards greater coherence in the conditions offered, as well as the inclusion of broader and more equitable criteria to expand access to these green financial products. On the other hand, the identification of specific needs by country and sector, as well as the consideration of differential approaches, such as gender and geographic location, are key steps to strengthen the adoption and positive impact of these initiatives in CAN countries.

Box 4.1 Preparation for climate financing in practice: the Colombian case

Semi-structured interviews were conducted for the Colombian case to transcend objective measurements and gain a deeper understanding of the experience and challenges identified by the main actors in climate finance. The results are summarized below. Five interviews were conducted, including a government entity, a commercial bank, an association in financial institutions, a large company in the real sector, and an independent international organization. Annex A details the questions that guided the interviews, segregated by type of institution.

It is encouraging to note that entities from Colombia's public and private sectors have developed the necessary capacities to identify their priorities regarding climate change, particularly around mitigation. The government, with the aid of technical assistance, has created various policy instruments, such as the National Climate Change Adaptation Plan (PNACC), the Nationally Determined Contribution (NDC), and the Long-Term Climate Strategy (E2050). Equally reassuring is the government's proactive approach in transferring this knowledge to the private sector through sectoral strategies for managing climate risks, including self-diagnosis tools for companies. This demonstrates a strong commitment to climate finance and the potential for further progress.³ In 2012, the *Protocolo Verde* was established, a pioneering initiative in the Latin America and Caribbean region. This landmark achievement not only set a precedent but also established a direct line of communication between the banking guild and the Ministry of Environment and Sustainable Development (Minambiente), a testament to the significant progress made in the region. This is a source of pride for all stakeholders involved in climate finance in Colombia.

While the Colombian government has a clear roadmap for addressing both mitigation and adaptation to climate change, progress is more pronounced in the former. On the other hand, adaptation is given less priority, both by the government and the private sector. This is partly due to challenges in defining adaptation activities and measuring their effects. Despite these obstacles, collaborative efforts between the financial industry and the government are underway to advance adaptation in line with international guidelines.

³ It is an "inter-institutional voluntary agreement" that was signed by the National Government and the financial sector of Colombia, represented by Minambiente and Asobancaria, respectively.

A significant obstacle to accessing climate finance is the limited development of the green project portfolio. Although there are initiatives to identify green projects from different approaches, such as project acceleration systems, the collegiate body of the Green Climate Fund (GCF) in Colombia, and the office of green businesses of Minambiente, the country's economic context makes many of these projects not easily "bankable" (located in remote areas, limited access to infrastructure, and sometimes public order problems).

The private sector in Colombia has a significant role in driving sustainability and climate action. This role has been influenced, in part, by guidelines issued by the financial regulator outlining the expected course. To adhere to these guidelines, several entities have opted to form alliances with multilateral entities with previous experience applying environmental criteria. This indicates the need to strengthen the country's internal capacities. The companies that have made the most progress in sustainability and climate action tend to have a strategic focus and the capacity to measure their environmental impact. This underscores the need to develop internal capacities and foster partnerships to promote sustainability in the private sector.

In line with the above, the private sector seeks more significant support for real-sector companies regarding climate action, sustainability, and disclosure requirements. This is especially relevant for medium and small companies that are often focused on survival. This support is crucial for financial entities to be able to measure and report their exposure to climate risk through their credit operations, facilitating their alignment with sustainability goals.

Another relevant issue is the application of Colombia's Green Taxonomy, which constitutes an important step in creating clear definitions. However, some private entities face difficulties aligning due to data demands. In the banking sector, specifically, there is fear of a possible bottleneck due to the amount of information needed to identify green lines, even for low-amount credits, representing a significant part of the portfolio. This can generate a risk of underreporting, with banks continuing to finance green projects without reporting them due to the possibility of exposing themselves to reputational risks.

The national MRV system for climate finance presents additional challenges. The public entities interviewed indicate that the system is effective in tracking public resources but not so with private sector resources. So far, tracking of these resources is based on data from a sample of companies to the National Administrative Department of Statistics (DANE), which limits the vision of private flows in climate finance. To address this challenge, strategies are needed that allow for more accurate tracking and a more complete perspective of these flows.

Additionally, two key recommendations for the MRV are identified. First, improving the system's connection with the impact of greenhouse gas emissions is crucial, as the current lack of this connection hampers informed decision-making. Second, work is needed to integrate Colombia's Green Taxonomy with the MRV, given that their different project classifications can affect the coherence in tracking climate finance flows.

The private sector has integrated international standards for reporting sustainability performance, recognizing its importance in business management, even before the Superintendencia Financiera de Colombia (SFC) mandated it for securities issuers. Some leading banks have been working on proprietary tools to measure financed emissions, and recently, the banking association (Asobancaria) launched a standardized version for all entities to complete their measurements by 2025. However, this system requires improvements, such as access to direct emissions data from clients and the development of national estimates to calculate them since regional averages have been used so far. This situation represents a significant opportunity to improve the national MRV system with information on private financing flows.

To conclude, Colombia has made progress in preparing for climate financing, building a robust regulatory framework, and advancing in planning, accessing funds, executing, and monitoring resources, with coordinated efforts between the public and private sectors. However, it faces challenges in creating a portfolio of green projects that can directly connect with funding sources and implementing tools such as the green taxonomy. There is also a need to strengthen the monitoring of private financial flows for informed decision-making; the linkage between the MRV system and Colombia's Green Taxonomy could play a key role in achieving this.

5. Conclusion

This work evaluates, by means of two main aspects, the degree of preparation of the financial systems of Andean Community countries for the decarbonization of their economies. First, the minimum basic conditions are established for financial systems to catalyze the mobilization of resources towards environmental objectives. Secondly, the current supply of green financial products in the region is described, to establish where the financial sector should advance. Preliminary results reveal a mixed outlook of progress, challenges, and opportunities.

To analyze the level of readiness of the four countries for climate finance, on the basis of the relevant literature, we conceived a series of indicators, grouping them into four main categories of readiness for finance (Vanderweerd et al., 2012). According to the results obtained, the region has made considerable progress in the financial planning component, which constitutes the base of the pyramid, as it includes elements related to the identification of national priorities regarding climate change and financing needs. Meanwhile, the capacities built to access climate finance represent a lower level of development, judging by the limitations of several countries in the area to directly access resources from international sources, such as the Green Climate Fund (GCF), as well as by how difficult it is to establish a portfolio of bankable projects. Given that this could become a significant obstacle to acquiring essential resources in the fight against climate change, the recommendation is to prioritize and strengthen efforts in this area, with the aim of improving the region's capacity to access climate finance.

With respect to financing execution, the region as a whole is at a medium level of development, which is particularly aided by factors related to the dissemination of knowledge, but work is needed on the involvement of the private sector to accelerate the implementation of the climate agenda and catalyze financing in the region. Finally, countries in the region must still consolidate efforts to advance in a key area of climate action: measurement, reporting and verification of climate finance are essential to measure progress, as well as to determine priorities and needs. In this aspect, only Colombia shows greater development than the average for the region, although its system is susceptible to improvement.

The study also identified that each of the countries analyzed has specific strengths. For example, Bolivia has been a pioneer in creating the entities responsible for financing and managing climate change and for the comprehensive legal framework that supports these efforts. Colombia stands out thanks to its solid institutional infrastructure and the participation of the private sector. Ecuador excels in institutional coordination and knowledge management but needs to strengthen its public-private collaboration and accessibility to environmental monitoring. Peru shows robustness in institutional development and collaboration with civil society, with a need for greater participation of the private sector in decision-making. These national strengths open opportunities for south-south cooperation, which seems limited in the Andean Community for issues related to climate change.

Regarding the financial sector, there is a growing interest in green products in these countries, although with variations in supply between them, in line with international trends. Colombia is the leader in the region in terms of the number of institutions that offer green financial products, followed by Ecuador and Peru. However, only Colombia and Peru seem to have a supply of green investment products by the financial entities included in the search. This is important because it offers users the possibility of allocating resources towards sustainability, involving both the private sector and civil society. The identification of specific needs by country and sector, along with the adoption of differential approaches, will be key to strengthen adoption of green alternatives and maximize the positive impact of green initiatives in the Andean region.

It is essential to continue strengthening the different components of climate finance analyzed in this study and expanding and standardizing the region's portfolio of sustainable products. Cooperation between CAN countries emerges as a promising vehicle to share solutions, overcome common barriers, and take advantage of the individual strengths of each member towards a future that is more sustainable and resilient to climate change.

ANNEXES

Annex A. Structure of semi-structured interviews.

The semi-structured interviews are scheduled to take place in February. We will rely on the perspective of various types of agents, considering that the urgency of climate finance corresponds to both public and private actors. To design the questionnaires, we took into account the works of Vanderweed et al. (2012), The Nature Conservancy (2012), Nakhooda et al. (2013), Samuwai & Maxwell (2018) and Caldwell & Larsen (2021), which provide a conceptual foundation. In addition, a technical document on the identification of barriers and opportunities for the development of the green financial products market in Colombia was very useful to establish important points in each of the categories (Ortiz et al., 2022). However, for the purposes of classifying the questions, we based our work on the components of climate finance readiness from Vanderweed et al. (2012), described above.

Recipients of private sector financing

Initially, we want to investigate the conditions of the recipients of the financing, specifically Financial or Sustainability Vice Presidents (CFOs, or CSOs) of companies. Taking into account the four components of climate finance defined by Vanderweed et al. (2012), we conceived following structure:

Financial planning	Capacities to access financing	Capacities to execute financing	Measurement, Reporting and Verification
How is the access to financing planned?	How do they access financing?	How do they execute, implement and coordinate?	How do they measure and report?
Transversal question: How are issues of gender and social inclusion taken into consideration?			

Part I: Financial planning

- » Have they identified needs/priorities regarding climate change?
- » Have they identified financing options/sources?
- » What have been the main challenges and opportunities in both cases?

Part II: Capacities to access financing

- » Have they accessed/trying to access climate finance resources through...?
 - » GFP (credit lines)
 - » Theme bonuses
 - » Blended finance (e.g. concessional resources)
 - » Technical assistance.
- » Have they formulated financially viable project/program proposals to seek access to financing?
- » What have been the main challenges and opportunities in both cases?

Part III: Capacities to execute financing

- » Have they executed projects related to climate change?
- » Have they designed/accessed training programs related to climate change for interest groups?
 - » Employees
 - » Managers
 - » Customers
 - » Communities
- » Are they aligned with national/international frameworks for classifying green projects?
- » Have they made strategic alliances with government/territorial/private organizations to address climate change?
- » What have been the main challenges and opportunities in all cases?

Part IV: Measurement, Reporting and Verification

- » Do they have a system for identifying and measuring climate change impacts (double materiality)?
- » Do they monitor the number of resources directed toward climate change?
- » Do they publish information related to impacts and financing of climate change activities?
- » What have been the main challenges and opportunities in all cases?

Government entities

In this case, the aim is to investigate the capacities at the country level, from the perception of government entities that participate in the coordination of instances for climate action, under the following structure:

Financial planning	Capacities to access financing	Capacities to execute financing	Measurement, Reporting and Verification
How much progress has been made in planning for climate finance?	What actions have been taken to access financing?	How has the execution of financing been coordinated?	How has the country progressed in terms of MRV?
Transversal question: How are issues of gender and social inclusion taken into consideration?			

Part I: Financial Planning

1. How aligned is the Development Plan with national priorities regarding climate change (mitigation and adaptation)?
2. Is climate action only the responsibility of the Ministry of the Environment or is that responsibility formally shared with other ministries?
3. Does the Government involve the private sector in climate change financing? If so, under what mechanisms?
4. On the other hand, does the private sector actively seek public resources for activities related to climate change?
5. Has the country received technical support for climate change planning? Are there already built capacities and sufficient expertise for these topics?
6. Have the main sources of climate finance for the country been mapped?

Part II: Capacities to access financing

7. How easy is it to attract international cooperation funding for the country's climate change priorities?
8. Is there a portfolio of properly prepared projects/programs that facilitate access to both national and international resources?
9. What are the main climate finance mechanisms in the country? Do you think the offer is sufficient? Which ones should be developed/promoted?
10. What is the role of the financial sector in access to climate finance? What are the main challenges for this? How do you think their participation could be encouraged?

Part III: Capacities to execute financing

11. How efficient is the allocation of resources related to climate finance in the country, in terms of quantity, fluidity and relevance?
12. How does the financial system contribute to channeling climate finance resources for decarbonization activities?

13. Where are the biggest challenges?
14. Are all levels of public administration (national, departmental, municipal) knowledgeable about climate change and project formulation and execution capacities? What shortcomings have been identified?
15. Please specify the perceived needs regarding the following elements to improve climate finance execution indicators:
 - » Capacity building
 - » Human capital
 - » Intersectoral coordination
 - » Interinstitutional coordination
 - » Private sector participation

Part IV: Measurement, Reporting and Verification

16. Has the government received technical assistance to develop Measurement, Reporting and Verification systems?
17. How developed is the Measurement, Reporting and Verification system in the country?
18. In addition to monitoring flows, is there any characterization by sector?
19. How is the impact of flows monitored?
20. What are the perceived strengths in the system? And the main challenges?
21. How can the information be accessed?

Transversal: Gender considerations

22. Are issues related to gender and diversity being considered when proposing strategies?

Investors and banking

The objective of this instrument is to inquire into the perception of representatives of entities that have the potential to mobilize resources for climate action from the private sector. The construction of the instrument closely follows the definition of the four components of climate finance readiness by Vanderweerd et al. (2012), under the following structure:

Financial planning	Capacities to access financing	Capacities to execute financing	Measurement, Reporting and Verification
How much progress has been made in planning for climate action financing?	What has been the preparation to mobilize resources towards these activities?	How has the execution of financing been coordinated?	How has the entity advanced in measurement, reporting and verification systems?
Transversal question: Are there additional considerations regarding gender and social inclusion issues?			

Additionally, we included notions from the works of The Nature Conservancy (2012), Nakhooda et al. (2013), Samuwai & Maxwell (2018), Caldwell & Larsen (2021) and Ortiz et al. (2022), to complement the conceptual foundation.

Part I: Financial planning

1. Is there an internal strategy related to decarbonization? Where has it been established (e.g., statutes, strategy, etc.? What has motivated it?)
2. How does the strategy relate to national priorities on climate change and decarbonization?
3. Have the sources of climate finance that allow them to obtain resources at a lower cost been identified (and accessed)?

Part II: Capacities to grant financing

4. How does the strategy translate into financing/investment decisions? That is, there are restrictions for investment, it is incorporated in the Investment Policy Statements...
5. In debt or equity investments, are aspects related to environmental performance being considered in addition to financial performance, e.g. corporate strategy, information disclosure?
6. Is there a policy of negative/positive filtering of sectors or industries based on climate change for investment and financing decisions? What are some examples?
7. Is there any type of taxonomy being used to classify the projects to be invested in?
8. Has there been training/technical assistance to evaluate environmental costs/benefits?
9. Have they received training on climate change issues across the entire company: from the sales force to senior management?

Part III: Capacities to execute financing

10. What are the main challenges regarding the financing/investment of activities related to climate change?
11. What are the expectations regarding the companies in which they invest/finance to grant resources?
 - » Adherence to national/international standards/taxonomies
 - » Adherence to environmental/sustainable strategies
 - » Project impact (in addition to financial viability)
 - » Other. Which one?
12. What are the main challenges to be encountered to mobilize (more) resources towards decarbonization, in terms of the companies that would receive them?
13. What is needed from the regulator and the government to allocate more resources towards decarbonization? For example, guarantees, subsidies, training, applicability of the taxonomy...

Part IV: Measurement, Reporting and Verification

14. Is there a system to measure, report and verify contributions made to climate action, both in operation and in investments/portfolio? How developed is said system?
15. Has the information from the MRV system (if it already exists) been used for decarbonization investment/financing decisions?
16. What are the main challenges?

Additional: Gender considerations

17. Have issues of gender and diversity been considered when proposing strategies?

Annex B. Preparation for climate finance: details of the indicators, and assessment for Peru and Colombia

#	Description	Category	Subcategory	Source of the indicator	Score Bolivia	Score Colombia	Score Ecuador	Score Peru	Scoring criteria
		(UNDP, 2012)	(Our team + Chat GPT)						
1	The national statistics department has a measurement system on GHG emissions	1.Financial planning	Assessment and Planning	Our Team	0	3	2	2	Zero: There is none. One: it is in development. Two: it works but is outdated. Three: it works and is up to date.
2	A national climate financing policy has been developed	1.Financial planning	Assessment and Planning	Samuwai et al - Fiscal	0	3	3	0	Zero: There is none. One: it is in development. Two: it works but is outdated. Three: it works and is up to date.
3	A national strategy or plan to implement national climate change priorities exists where risk and opportunities of CC are identified	1.Financial planning	Assessment and Planning	Samuwai et al - Institutions	0	3	3	2	Zero: There is none. One: it is in development. Two: it works but is outdated. Three: it works and is up to date.
4	The NDC has been costed	1.Financial planning	Assessment and Planning		0	3	3	3	Zero: There is none. One: it is in development. Two: it works but is outdated. Three: it works and is up to date.
5	CC priorities are mentioned explicitly in the national climate policy	1.Financial planning	Assessment and Planning	Samuwai et al - Institutions	3	3	3	3	Zero: There is none. One: it is in development. Two: it works but is outdated. Three: it works and is up to date.
6	Key ministries account for CC in national fiscal budgeting planning	1.Financial planning	Assessment and Planning	Our team, based on Samuwai et al - Knowledge	0	3	3	3	Zero: There is none. One: it is in development. Two: it works but is outdated. Three: it works and is up to date.

#	Description	Category	Subcategory	Source of the indicator	Score Bolivia	Score Colombia	Score Ecuador	Score Peru	Scoring criteria
		(UNDP, 2012)	(Our team + Chat GPT)						
7	A specialized climate change department has been set up	1.Financial planning	Coordination and Institutions	Samuwai et al - Institutions	3	3	3	3	Zero: There is none. One: it is in development. Two: it works but is outdated. Three: it works and is up to date.
8	CC related acts and policies have been passed and endorsed by parliament	1.Financial planning	Coordination and Institutions	Samuwai et al - Institutions	3	3	3	3	Zero: There are none. One: None of them are updated. Two: one is updated, and one is not. Three: both are updated.
9	The core functions and roles of national institutions relating to CC are explicitly mentioned	1.Financial planning	Coordination and Institutions	Samuwai et al - Institutions	3	3	3	3	Zero: There is none. One: it is in development. Two: it works but is outdated. Three: it works and is up to date.
10	A national climate change committee has been set-up	1.Financial planning	Coordination and Institutions	Samuwai et al - Institutions	0	3	3	3	Zero: There is none. One: it is in development. Two: it works but is outdated. Three: it works and is up to date.
11	Existing planning process takes into consideration available evidence on CC	1.Financial planning	Knowledge Management	Our team, based on Samuwai et al - Knowledge	3	3	3	3	Zero: There is none. One: it is in development. Two: it works but is outdated. Three: it works and is up to date.
12	Global and regional learning have been adapted to the national context	1.Financial planning	Knowledge Management	Samuwai et al - Knowledge	3	3	3	1	Zero: There is none. One: it is in development. Two: it works but is outdated. Three: it works and is up to date.
13	The country has received finance for several activities under GCF/Adaptation fund/GEF	2.Accessing finance	Accessing GCF funding	Our team, based on Caldwell & Larsen	1	3	3	3	Zero: it has not received any. One: it has received once. Two: it has received more than once, from a single entity. Three: it has received more than once, from different entities.

#	Description	Category	Subcategory	Source of the indicator	Score Bolivia	Score Colombia	Score Ecuador	Score Peru	Scoring criteria
		(UNDP, 2012)	(Our team + Chat GPT)						
14	# of Direct Access Entities (DAEs) for the GCF/Adaptation fund	2.Accessing finance	Accessing GCF funding	Our team, based on Caldwell & Larsen	0	3	0	2	Zero: there is none. One: it is in the process of being certified. Two: only one has been certified. Three: more than one has been certified.
15	The country's DAEs have received funding by the GCF/Adaptation fund	2.Accessing finance	Accessing GCF funding	Our team, based on Caldwell & Larsen	0	1	0	3	Zero: there is none. One: there is only the readiness one (through the DAEs). Two: there is the funding one. Three: there has been more than one.
16	The country has accessed readiness programs under GCF/Adaptation fund	2.Accessing finance	Accessing GCF funding	Our team, based on Caldwell & Larsen	2	3	2	3	Zero: it has not received any. One: it has received once. Two: it has received more than once, from a single entity. Three: it has received more than once, from different entities.
17	A national entity has been accredited by the GCF or the Adaptation Fund	2.Accessing finance	Accessing GCF funding	Samuwai et al - Institutions	0	3	0	2	Zero: There is none. One: it is in the process of being certified. Two: only one has been certified. Three: more than one has been certified.
18	National development banks have credit lines specifically aimed at decarbonization	2.Accessing finance	Institutional and Funding Mechanisms	Our Team	1	3	3	2	Zero: there is none. One: there is one. Two: there are two. Three: there are three or more.
19	There is a legal framework reflecting CC priorities, with incentives, special market conditions, and compliance mechanisms	2.Accessing finance	Institutional and Funding Mechanisms	Samuwai et al - Institutions	1	2	1	2	Zero: there is none. One: there are up to 20. Two: there are up to 30. Three: there are over 30.

#	Description	Category	Subcategory	Source of the indicator	Score Bolivia	Score Colombia	Score Ecuador	Score Peru	Scoring criteria
		(UNDP, 2012)	(Our team + Chat GPT)						
20	Have accessed climate finance from sources other than GEF/ GCF/Adaptation Fund	2.Accessing finance	Institutional and Funding Mechanisms	Samuwai et al - Fiscal	1	3	3	3	Zero: there is none. One: there are up to 3. Two: there are up to 6. Three: there are up to 9.
21	A national climate fund has been established	2.Accessing finance	Institutional and Funding Mechanisms	Samuwai et al - Fiscal	3	3	2	0	Zero: there are none. One: it is in creation or announced. Two: there are private or public funds partially dedicated to this. Three: there is a state fund.
22	Long-term financial commitments for CC-related investments have been made by government	2.Accessing finance	Institutional and Funding Mechanisms	Samuwai et al - Fiscal	0	3	3	3	Zero: there are none. Three: there are.
23	Budgetary support from donors for CC activities has been received	2.Accessing finance	Institutional and Funding Mechanisms	Samuwai et al - Fiscal	0	0	3	3	Zero: there are none. Three: there has been at least on one occasion.
24	A pipeline of national priority climate change projects exists	2.Accessing finance	Institutional and Funding Mechanisms	Samuwai et al - Fiscal	0	3	3	3	Zero: There is none. One: it is in development. Two: it works but is outdated. Three: it works and is up to date.
25	Innovative financing options have been developed to respond to the challenges of CC	2.Accessing finance	Institutional and Funding Mechanisms	Samuwai et al - Fiscal	0	3	3	3	Zero: there are none. One: there is at least one type of instrument in one entity. Two: there is at least one instrument in several entities. Three: there are several instruments in several entities.

#	Description	Category	Subcategory	Source of the indicator	Score Bolivia	Score Colombia	Score Ecuador	Score Peru	Scoring criteria
		(UNDP, 2012)	(Our team + Chat GPT)						
26	Estimated mobilized financing as a proportion of the total funding required for CC projects aligned to national priorities	2.Accessing finance	Institutional and Funding Mechanisms	Samuwai et al - Fiscal	0	2	1	1	Zero: information not available. One: there are estimations of costs and needs but the gap has not been explicitly estimated. Two: the gap is calculated but the investment requirement is not met. Three: the required investment has been met.
27	A coordination mechanism for development partners/ donors for climate change related funding, dialogue, and programming exists	2.Accessing finance	Institutional and Funding Mechanisms	Samuwai et al - Institutions	0	3	3	0	Zero: There is none. One: it is in development. Two: it works but is outdated. Three: it works and is up to date.
28	CC knowledge is shared among stakeholders and is accessible through appropriate media/platforms	3.Delivering finance	Knowledge dissemination and capacity building	Based on Samuwai et al - Knowledge	3	3	3	2	Zero: There is none. One: it is in development. Two: it works but is outdated. Three: it works and is up to date.
29	Local governments and stakeholders have access to national and/or regional sources of expertise on CC (state, local or private)	3.Delivering finance	Knowledge dissemination and capacity building	Samuwai et al - Knowledge	0	2	0	3	Zero: there are none. One: mechanisms are being prepared. Two: the mechanisms are there but errors have been detected. Three: mechanisms officially exist.

#	Description	Category	Subcategory	Source of the indicator	Score Bolivia	Score Colombia	Score Ecuador	Score Peru	Scoring criteria
		(UNDP, 2012)	(Our team + Chat GPT)						
30	Government collaboration with research institutions to identify, apply, and institutionalize CC knowledge.	3.Delivering finance	Knowledge dissemination and capacity building	Samuwai et al - Knowledge	3	3	3	3	Zero: there is none. Three: there is.
31	Routine public awareness programs have been undertaken	3.Delivering finance	Knowledge dissemination and capacity building	Samuwai et al - Knowledge	0	3	0	3	Zero: there was no evidence of official awareness campaigns by the national government. Three: there is evidence.
32	Specialized training is conducted in partnership with regional and multinational development partners	3.Delivering finance	Knowledge dissemination and capacity building	Samuwai et al - Knowledge	3	3	3	3	Zero: there was no evidence of official awareness campaigns by the national government. Three: there is evidence.
33	Non-traditional stakeholders including Civil Society Organizations (CSOs) and private sector participate in CC program planning, implementation, and M & E	3.Delivering finance	Stakeholder Engagement and Collaboration	Samuwai et al - Fiscal	1	3	1	1	Zero: there are none. One: there are private entities participating in concrete projects or in discussions. Two: there is at least one entity participating in specialized committees with official entities. Three: more than one private entity participates.

#	Description	Category	Subcategory	Source of the indicator	Score Bolivia	Score Colombia	Score Ecuador	Score Peru	Scoring criteria
		(UNDP, 2012)	(Our team + Chat GPT)						
34	A central data management system has been established at national level to track, store, and monitor climate change projects at national level and community level	4.MRV	MRV	Samuwai et al - Knowledge	1	1	1	2	Zero: There is none. One: it is in development. Two: it works but is outdated. Three: it works and is up to date.
35	MRV system for domestic climate finance exists	4.MRV	MRV	Samuwai et al - Fiscal	1	3	1	1	Zero: There is none. One: it is in development. Two: it includes MRV but does not explain the methodology. Three: there is MRV and an explanation for the methodology.
36	MRV system for international climate finance exists	4.MRV	MRV	Samuwai et al - Fiscal	1	3	1	1	Zero: There is none. One: it is in development. Two: it includes MRV but does not explain the methodology. Three: there is MRV and an explanation for the methodology.
37	A standardized methodology and key performance indicators to evaluate adaptation/mitigation program's effectiveness exists at the national level	4.MRV	MRV	Samuwai et al - Knowledge	0	3	3	0	Zero: There is none. One: it is in development. Two: it includes MRV but does not explain the methodology. Three: there is MRV and an explanation for the methodology.

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