

PROMOTING A PANDEMIC RECOVERY: EVIDENCE TO SUPPORT MANAGING THE GROWING DEBT CRISIS PROJECT

FISCAL AND FINANCIAL CHALLENGES OF CLIMATE TRANSITION IN LATIN AMERICA

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SUPPORT

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FISCAL AND FINANCIAL CHALLENGES OF CLIMATE TRANSITION IN LATIN AMERICA

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The project was led by Fernando Lorenzo (Centro de Investigaciones Económicas, CINVE/Red Sur). The academic direction of the project and the process of elaboration of this document was carried out by Red Sur Regional Technical Coordination team, composed of Andrés López (IIEP-UBA-CONICET/Red Sur), Ramiro Albrieu (Red Sur), Luis Miguel Galindo (Universidad Nacional Autónoma de México, UNAM) and Álvaro Ons (CINVE/Red Sur).

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The series of publications resulting from the project includes the following titles that are published as Red Sur Working Papers and Policy Briefs, available at www.redsudamericana.org:

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| Policy Brief No 2/2023 | LAC Policy Brief “Results and Policy Implications in Latin America” | Miguel Galindo (UNAM), Fernando Lorenzo (CINVE/Red Sur) and Ramiro Albrieu (Red Sur) |
| Policy Brief No 3/2023 | Construyendo un futuro sostenible en el Sur Global | Ramiro Albrieu (Red Sur) |
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| Policy Brief No 6/2023 | Policy Brief III - Ethiopia: A Two-Edged Sword: The Impact of Public Debt on Economic Growth—The Case of Ethiopia | Addis Yimer and Alemayehu Geda (Addis Ababa University/AAU) |
| Working Paper No 1/2023 | Background Document ‘Fiscal and Financial Challenges of Climate Transition in Latin America’ | Luis Miguel Galindo (UNAM) and Fernando Lorenzo (CINVE/Red Sur) |
| Working Paper No 2/2023 | Climate Change, Fiscal Risks and Public Debt Management in Latin America | Luis Miguel Galindo (UNAM) and Fernando Lorenzo (CINVE/Red Sur) |
| Working Paper No 3/2023 | Consumption Patterns and Environmental Taxation in Latin America | Luis Miguel Galindo (UNAM) and Fernando Lorenzo (CINVE/Red Sur) |
| Working Paper No 4/2023 | Investment Incentives and Sustainable Productive Transformation in Latin America | Andrés López (IIEP-UBA-CONICET/Red Sur) and Alvaro Ons (CINVE/Red Sur) |
| Working Paper No 5/2023 | Estudio País: Construyendo un Futuro Sostenible en Bolivia (in Spanish) | Omar Velasco, Wilson Jiménez, Josué Cortez and Diego Peñaranda (Fundación ARU) |
| Working Paper No 6/2023 | Estudio País: Construyendo un Futuro Sostenible en Honduras (in Spanish) | Gerson Urtecho, Sergio Sánchez and Luis Miguel Galindo (UNAM) |

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| Working Paper No 8/2023 | Effects Of Gender-Inequality During Global Health Emergencies: Evidence from Nigeria | Centre for the Study of the Economies of Africa (CSEA) |
| Working Paper No 9/2023 | Debt for Climate and Development Swaps in Nigeria | Centre for the Study of the Economies of Africa (CSEA) |
| Working Paper No 10/2023 | Determining the Optimal Carbon Pricing for Nigeria | Centre for the Study of the Economies of Africa (CSEA) |
| Working Paper No 11/2023 | Sustainable, Inclusive and Environmentally Responsive Debt in Uganda: Implication of COVID 19 | Economic Policy Research Centre (EPRC) |
| Working Paper No 12/2023 | Profile of Ethiopian Debt and Its Institutional Challenges: An Exploratory Analysis | Getnet Alemu and Alemayehu Geda (Addis Ababa University/AAU) |
| Working Paper No 13/2023 | Fundamental and Proximate Drivers of Public Debt in Ethiopia | Alemayehu Geda and Addis Yimer (Addis Ababa University/AAU) |
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EXECUTIVE SUMMARY

The objective of this study is to analyze the role of environmental fiscal policy and financing instruments in driving the transformations required in production and consumption patterns to support the climate transition in Latin American countries. The presentation aims to synthesize and organize the multiple dimensions that must be considered when designing national strategies for building a low-carbon and climate-resilient economy for the 2050 - 2070 horizon.

Over the last three decades, Latin America has shown a weak and volatile economic growth rate that has contributed to an increase in *per capita* income, consumption, employment and poverty reduction. However, this economic dynamism has been insufficient to address chronic poverty, the high concentration of income or the generation of formal jobs. It has, also, generated a set of negative externalities that are eroding the current economic dynamism.

Climate change represents one of the great challenges of the 21st century. Its impacts are significant, generalized throughout the economy and economic activities, in some cases non-linear and irreversible, and with more intense effects in poor and warmer countries. These impacts harm the long-term growth rate of GDP or GDP *per capita*, which negatively affects development prospects. At the same time, the Paris Agreement on climate change aims to stabilize the temperature increase between 1.5° C and 2° C during this century, which requires the global economy to be carbon neutral between 2050 and 2070. However, the targets established in the Nationally Determined Contributions (NDCs) per country are not consistent with the Paris Agreement and, moreover, do not adequately define the public policies to be applied.

Increasing the ambition of the NDCs requires implementing structural transformations to the current unsustainable development style. This is illustrated by current consumption patterns, which show a decrease in the share of food expenditure in total expenditure by income group (quintiles) as income increases. These new consumption spaces are covered by increased spending on private transportation (fossil fuels and automobiles), private education, private health and household appliances. This reflects the migration process from public transport to private transport, from public health to private health, from public education to private education, as a result of the growing dissatisfaction with the quality and services offered by these public services. This configures a society that is increasingly segmented and where greater use of private transportation makes compliance with mitigation goals more difficult.

The greenhouse gas emissions trajectories for Latin America show that the inertial scenario is inconsistent with deep decarbonization. The orderly and disorderly mitigation scenarios that would lead to a carbon-neutral economy by 2050 require energy efficiency and decarbonization rates higher than the current ones. Moreover, the scenario where the start of the mitigation strategy is postponed to 2030 requires decarbonization rates that are implausible and most likely economically inefficient.

Addressing the challenge of climate change requires implementing a new fiscal and financing strategy that is consistent with deep decarbonization. The implementation of a green fiscal strategy is based on the application of Pigou-type taxes where the polluter pays. Available evidence shows that these taxes are generally concentrated on energy (electricity, fuels) and water and increasingly incorporate tariffs on some economic activities (agricultural and industrial) and waste. There is also the application of a price on carbon, however, there is still high uncertainty about its specific value.

The implementation of these taxes has been incorporated into green tax reforms (GTRs). These green tax reforms consider, for example, the effects of weak or strong double dividends on GDP or income distribution or smart tax measures that can contribute to gender equality. Evidence shows that environmental taxes generally reduce the negative externality but do not entirely control it. This is because the goods that caused the negative externality have a high-income elasticity and a low-price elasticity of demand. Thus, in a scenario of continuous economic growth, small tax increases reduce the growth rate of demand but do not eliminate it.

Some of these green taxes can have regressive income distribution effects, mainly on electricity, and progressive income distribution effects on fuels for private transportation and automobiles. Thus, green tax strategies should contemplate their potential collateral effects on the population's welfare and where fiscal recycling processes should be considered.

The magnitude of the structural transformations associated with green tax reform requires consideration of their viability and the political economy they imply. Therefore, the implementation of these fiscal reforms must be based on a broad social consensus that makes them viable and where the positive consequences for the population as a whole must be evident. In this sense, they must incorporate a contribution to better income distribution.

Incorporating these structural transformations into the current development model requires a financing strategy. The structural transformations needed to build a carbon-neutral economy between 2050 and 2070 imply several transition risks that significantly impact the financial system. Evidence shows that the financial system does not properly incorporate the risks of the climate transition. For example, it does not incorporate the risks implied by stranded assets that will transfer into abrupt changes in the value of bank assets and affect their balance sheets. This will result in a carbon bubble.

However, in recent years there has been a substantial increase in thematic financing associated, for example, with green, sustainable, climate, Sustainable Development Goals, and gender bonds. These types of financing represent a fundamental lever for transformation. Non-compliance may result in higher payments. This can become an additional obstacle to development.

Thus, a new fiscal and financing policy consistent with a profound decarbonization of the economy is essential to implement the structural transformations required for the current development model. These fiscal and financing strategies should not only consider the preservation of current fiscal balances but also build a new fiscal and public debt management paradigm.

I. INTRODUCTION

The objective of this study is to analyze the role of environmental fiscal policy and financing instruments in driving the transformations in production and consumption patterns that are required to support the climate transition in Latin American countries. The aim is to synthesize and organize the multiple aspects that must be considered when designing national strategies for building a low-carbon and climate-resilient economy for the 2050 - 2070 horizon.

During the first two decades of the 21st century the region's development style has contributed to a continuous but volatile and heterogeneous economic growth that varies between countries and regions. It has been marked by increases in consumption, investment, employment and poverty reduction. However, current consumption patterns and the predominant forms of production show important deficiencies that are linked with marked inequalities in income distribution, the persistence of poverty and threats to the environmental sustainability of current economic growth processes. Reality shows that this style of development is putting global public goods such as climate (climate change), public health (Covid-19) and biodiversity at risk. These combine into a complex matrix of negative externalities, manifested, among other things, in environmental deterioration, which is eroding the base that has sustained the recent economic dynamism in the region.

In order to meet the challenges of sustainable and socially inclusive development, it is necessary to preserve global public goods, improve economic dynamism and efficiency, control the effects of negative externalities -global, regional and national-, contain the deterioration of natural capital, and address the important social challenges faced by the countries of the region.

Climate change and the Covid-19 pandemic reveal the risks of the current style of development in Latin America and illustrate the consequences of the loss of global public goods. Indeed, climate change, which originated from greenhouse gas (GHG) emissions, has significant economic, social and environmental costs, some of them irreversible (IPCC, 2014). Confronting the effects of climate change, which from an economic perspective represents a global negative externality, requires the implementation of a wide range of public policies. The toolbox should include taxes, incentives and regulations, the construction of productive and social infrastructures that contribute to overcoming the emerging weaknesses of current consumption patterns and technologies that are used in the production of multiple goods and services, as well as the implementation of regulations that are consistent with sustainable development.

The climate transition in Latin America implies overcoming obstacles that hinder compliance with the mitigation and adaptation goals that were agreed upon in the framework of the XXI International Conference on Climate Change, held in Paris in 2015, and which are expressed in the countries' Nationally Determined Contributions (NDCs) and Long-Term Strategies (LTS). Given the economic and social importance of productive activities that make significant use of natural resources whose sustainability is threatened by climate change, and given the presence of spending patterns that are inconsistent with a deep decarbonization strategy, the intensity of the transformation processes acquires particular characteristics in the region.

In this context, fiscal policy in general, and tax policy in particular, become fundamental tools for resolving negative environmental externalities and for successfully addressing the challenges of the climate transition. From a theoretical point of view, recourse to environmental taxation is based on the presence of market

failures that are manifested by the absence of market prices that reflect the collateral economic, social and environmental costs caused by negative externalities. Tax intervention seeks to correct and control these aspects by using instruments that are specifically designed to take the social cost of externalities into account. The first objective of environmental taxes is to reduce the demand for the good or service that causes the negative externality by increasing its price. A second objective of this type of tax is to contribute to greater economic efficiency, promote technological innovation and generate positive impacts on employment, the level of production and income distribution.

Implementing Environmental Fiscal Reforms has been part of the economic policy response to advance the climate transition in developed countries. For Latin America, the analysis of these experiences can help identify factors that should be considered when designing national strategies in response to climate change. A necessary condition for the viability of this type of reform is that each country's economic and institutional particularities be taken into account, both in terms of the characteristics of their tax systems and the most significant features of their political and social structures.

Environmental tax interventions involve political decisions that, logically, may have repercussions on various groups in society. Thus, given the varied and complex interests that may be affected, considerations of political economy are particularly relevant in the case of Environmental Tax Reforms.

The scale of the effort to transform the forms of production as well as consumption patterns required by the climate transition implies removing obstacles and establishing, as quickly as possible, an agenda that will allow the region's financial sector to play a more relevant role than it has to date.

A central axis of the work ahead for financial intermediaries and investors that provide financing for sustainable development in Latin American countries lies with efficient management of climate and social risks, acting in a precautionary manner on potential financial instability. The identification of investment opportunities in high-impact climate change projects emerges as a fundamental component of the profound transformation of the economy towards green and low-carbon schemes.

Without a significant contribution from the financial system, it is unlikely that it will be possible to design credible long-term GHG emission mitigation strategies that are consistent with a carbon-neutral economy for the 2050 - 2070 horizon. The starting point for mobilizing financial resources to address the climate transition involves delineating the components of a public policy strategy and a work agenda for the private sector that will serve as a reference for processing changes in the allocation of productive resources to move towards a low-carbon, climate-resilient, socially inclusive economy that meets the needs of preserving environmental resources that are threatened by inertial economic development.

The challenges involved in incorporating the risks and opportunities of climate change into financial activities entail a change with respect to the paradigm that has predominated in the region to date. The growing incorporation of environmental, social and governance sustainability factors in financial decisions should be interpreted as a structural basis for building the competencies required to become more active in sustainable financing. Assessing climate and social risks in banks' active portfolios involves identifying stranded assets, evaluating the eventual emergence of carbon or green bubbles, and generating genuine and profitable business opportunities that are needed to move towards a new low-carbon and resilient economy.

This paper is organized as follows. The second section includes a brief discussion of the climate change context for Latin America, the third section presents the main characteristics of the Nationally Determined

Contributions (NDCs), the fourth section presents the main characteristics of consumption patterns that indicate that they are not sustainable, the fourth section describes the main characteristics of tax instruments, the fifth section presents their use in the context of a green fiscal reform, the seventh section includes the political economy dimensions of environmental fiscal reforms (ETRs), section eight discusses the feasibility of these fiscal reforms, section nine presents a discussion of the energy subsidies that are at the center of the ETR discussion, section ten discusses the conditions and characteristics of climate and sustainable finance in Latin America, section eleven presents the relationships, including risks, that arise between climate change and the financial system, and finally, section twelve concludes and presents some general comments.

II. LATIN AMERICA IN THE FACE OF CLIMATE CHANGE

Climate change is a phenomenon with global causes and consequences, but with evident national and regional manifestations that are related to extreme weather events, sea level rise and biodiversity loss, which present relevant characteristics when analyzed from the perspective of Latin American countries (Persson and Dzebo, 2019). Incorporating these regional characteristics in the context of the global agenda is fundamental when intending to build a strategy consistent with the structural transformations required for a just climate transition towards carbon neutrality for the 2050 - 2070 horizon.

In 2020, CO₂e concentrations in the atmosphere reached 415 parts per million (ppm). Evidence shows that concentrations of 450 ppm in the atmosphere imply a 78% probability of reaching a 2° C increase in the global average temperature (Table 1). Stabilizing the climate by 2050 at no more than a 2° C global average temperature increase requires that current annual emissions go from around 55.36 GtCO₂ e in 2019 to 20 GtCO₂e in 2050 and 0 GtCO₂ e in 2070.

Table 1. Probabilities of temperature increase and gas concentrations greenhouse gases in the atmosphere

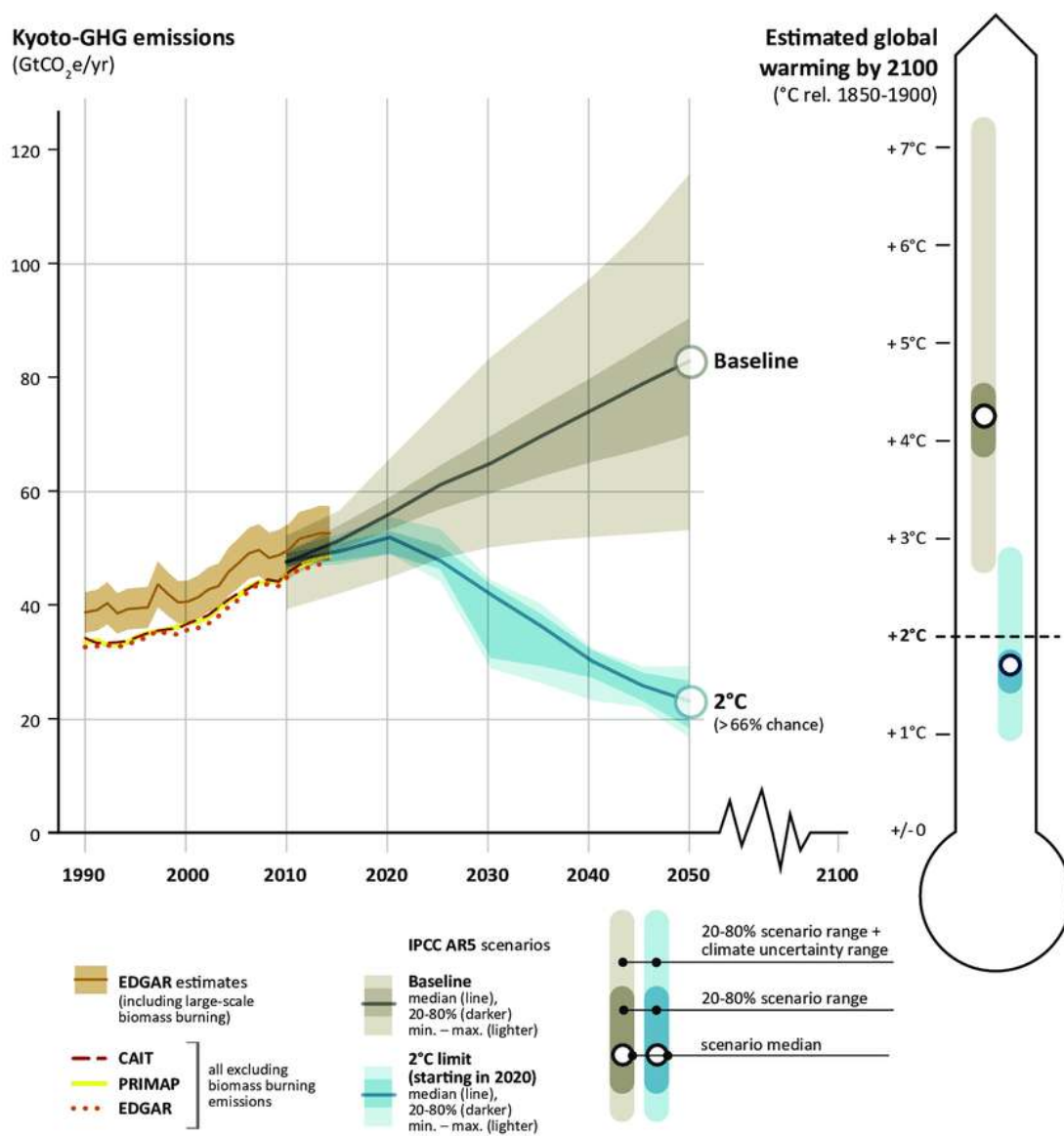
| Stabilization level (in ppm of CO ₂ eq) | 2°C | 3°C | 4°C | 5°C | 6°C | 7°C |
|-------------------------------------------------------|-----|-----|-----|-----|-----|-----|
| 450 | 78 | 18 | 3 | 1 | 0 | 0 |
| 500 | 96 | 44 | 11 | 3 | 1 | 0 |
| 550 | 99 | 69 | 24 | 7 | 2 | 1 |
| 650 | 100 | 94 | 58 | 24 | 9 | 4 |
| 750 | 100 | 99 | 82 | 47 | 22 | 9 |

Source: Stern (2007).

With a current global population of 7.3 billion inhabitants, which represents about 7.5 tons of CO₂e *per capita* in 2019, and taking into account that the world population will reach, approximately, 9 billion inhabitants by

2050, the mitigation effort implies reaching emissions equivalent to 2.1 tons *per capita* (Figure 1). Likewise, to meet the objectives of the Paris Agreement on Climate Change by 2030, it is necessary to reach, in an economically efficient scenario, 41 GtCO₂e, which, with a population of approximately 8.5 billion inhabitants, implies 4.8 tons of CO₂e *per capita*. Thus, stabilizing climate conditions requires a transition from 7.5 to 4.8 by 2030, from 7.5 to 2.1 tons per capita by 2050, and from 2.1 to 0 tons per capita by 2070.

Figure 1. Greenhouse gas emissions and projections till the year 2050



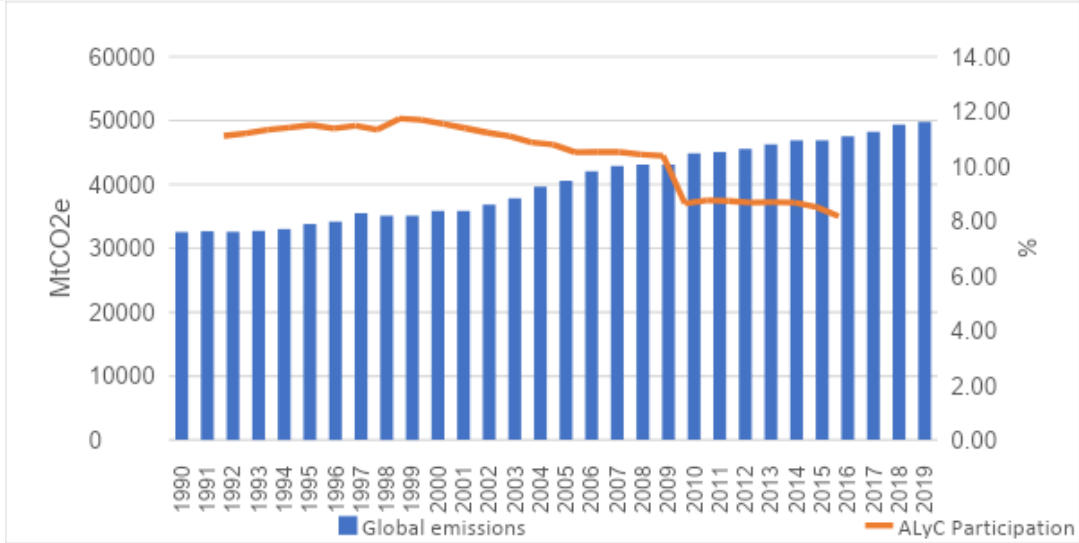
Source: UNEP, 2015

The data eloquently illustrate the urgency of climate action. The usual horizons of climate change analysis - 30, 50 or 100 years - induce a false perception that there is still significant time for action. However, given targets that imply a reduction in emissions of approximately 7 to 2 tons *per capita* in the coming years, and considering that much of the infrastructure being built today will be used over the next three to five decades, the time horizons for decisions in some areas are considerably narrow and must be compatible with a low-carbon, climate-resilient economy. Otherwise, infrastructure is being built that is not consistent with climate goals.

Although climate change is a source of environmental challenges on a global scale (Stern, 2007), the situation in Latin American countries is markedly different from that observed in the more advanced OECD economies. At a global level, the most important component in emissions is that from the energy sector; the rest of the sources of emissions represents a smaller percentage. The main source of emissions in the region's countries is, similarly, energy production and consumption. Other sources of emissions also stand out, such as those from land use change or agricultural activities and deforestation.

Figure 2 shows that in 2019 the countries of the region contributed 8% of total GHG emissions (CAIT-WRI 2023). This represents a small share of total historical emissions, though their share has increased in recent years. The region is, therefore, not among the largest emitters, but the fact that its share in the total emissions structure is becoming more important should not be ignored.

Figure 2. Global emissions and Latin America's share: 1990-2019.

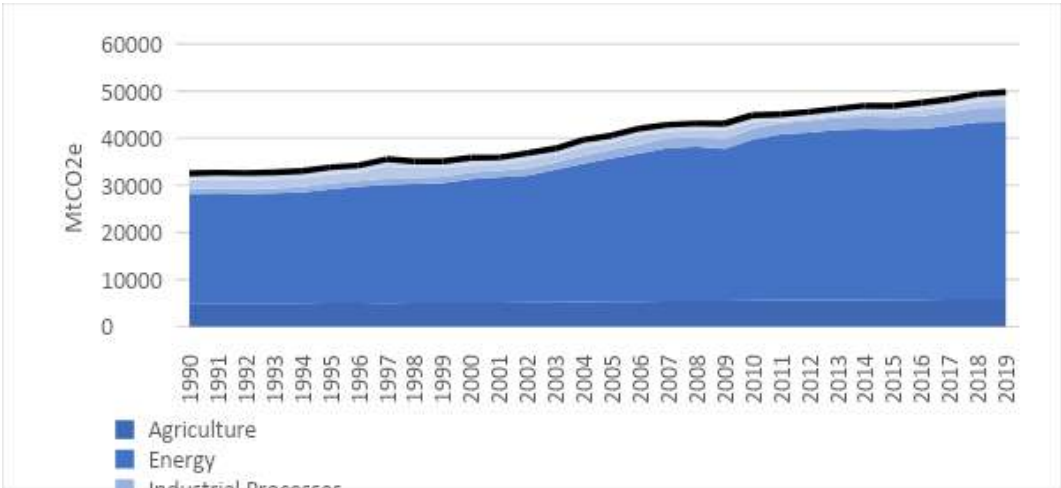


Source: Authors' elaboration based on CAIT-WRI 2023

Global emissions show the clear relevance of emissions from energy consumption (Figure 2). However, as can be seen in Figure 3, emissions from agricultural activities, waste and land use change (deforestation) are more important in Latin American countries. Therefore, the mitigation agenda in the region is not limited to energy. It is even possible that the region as a whole could meet a substantial part of the mitigation goals by

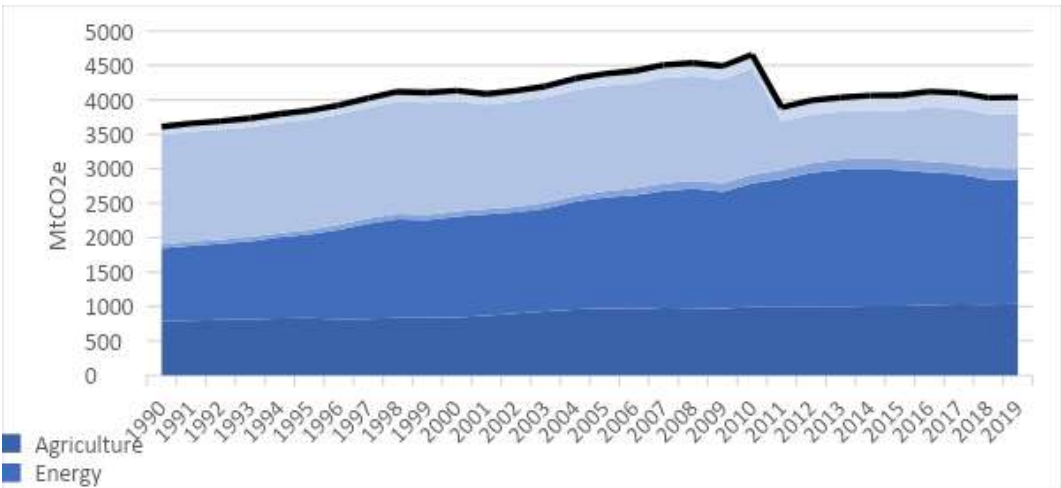
halting deforestation, achieving adequate solid waste management and making technological advances that transform the current forms of production in the agricultural sector, thus moving towards more sustainable practices.

Figure 3. Structure and evolution of global emissions: 1990-2019.



Source: Authors’ elaboration based on CAIT-WRI 2023.

Figure 4. Structure and evolution of emissions in Latin America and the Caribbean: 1990-2019



Source: Authors’ elaboration based on CAIT-WRI 2023.

The current growth rate of GHG emissions in Latin America is at the moment higher than the global rate, with an average annual rate of 0.5% between 1990 and 2018. Likewise, the average annual growth rate of emissions from energy is 2.1% between 1990 and 2018, which corresponds to an average annual GDP growth rate of 2.7%, an average annual growth rate of the ratio of energy consumption to GDP of -0.6% and

an average annual growth rate of the ratio of CO₂ee to energy consumption of 0.01%. The approximate average annual population growth rate is 1.3% (Table 2).

Table 2. Average annual growth rates of emissions from energy consumption, per capita emissions from energy consumption, GDP_t, GDP_{pct}, energy consumption, ratio of energy consumption to GDP_t, ratio of energy emissions to energy consumption and population in Latin America and the Caribbean: 1990-2018.

| | 1990-2000 | 2000-2010 | 2010-2018 | 1990-2018 |
|--------------------------------------|-----------|-----------|-----------|-----------|
| CO ₂ ee _{2t} | 3.15 | 2.03 | 0.47 | 2.11 |
| CO ₂ eePC _t | 1.67 | 0.91 | -0.47 | 0.83 |
| GDP _t | 2.87 | 2.91 | 1.41 | 2.73 |
| GDP _{pct} | 1.40 | 2.10 | 0.63 | 1.45 |
| CE _t | 2.19 | 2.34 | 1.02 | 2.10 |
| (EC/GDP) _t | -0.67 | -0.56 | -0.38 | -0.61 |
| (CO ₂ ee/CE) _t | 0.94 | -0.30 | -0.62 | 0.01 |
| POB _t | 1.46 | 1.11 | 0.77 | 1.27 |

Notes: Period: 1990-2018. Source: Galindo et al. (2022).

Despite their low participation in global emissions, LAC countries are vulnerable to the consequences of climate change. Several ECLAC and IDB studies (ECLAC, 2009; 2010; IDB-ECLAC-WWF, 2013) warn of the consequences of climate change on some countries' economic and social reality. The main vulnerabilities include impacts on productivity, agricultural yields and biodiversity loss. This occurs in a context in which there are significant changes in temperature distribution and rainfall patterns throughout the year. These alterations manifest themselves in a higher frequency of drought events and in a longer average duration of droughts.

Extreme climatic phenomena have been observed more frequently than in the past, both in terms of temperature and precipitation records. These changes are affecting water reservoirs - natural and artificial - which are of great importance for agricultural and livestock production.

These developments are of particular significance for most of the countries in the region insofar as they are economies with international specialization patterns in which agricultural and agro-industrial products account for a high share of exports. In fact, changes in climate are adding additional risk factors to those observed in the past. This is most clearly manifested in agricultural production, where they affect the average yields of many crops and complicate the management of climate risk in production.

Available studies also indicate rising sea levels and a greater frequency of extreme weather phenomena on sea and ocean coasts. In the case of the Andean countries, glaciers in the southern part of the Andes Mountains are retreating. This has negative consequences for the availability of water in urban and agricultural areas.

The new vulnerabilities extend to health aspects, where populations are increasingly exposed to tropical diseases that are attributable to climatic mutations. The picture is completed by a trend towards a decrease

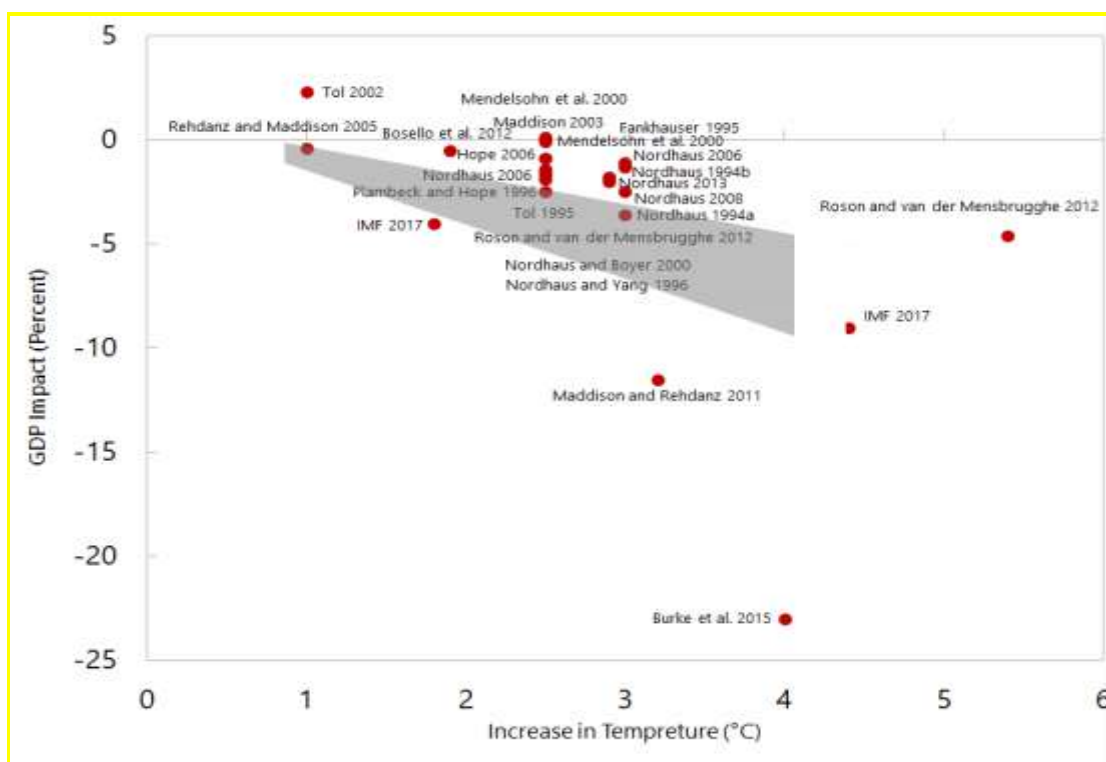
of tropical and subtropical forests in the area and a decline in biodiversity that threatens the integrity of native ecosystems.

The economic, social and environmental costs of climate change are significant at a global level, and its effects on economic performance have multiple transmission channels (Figure 5). LAC countries are particularly vulnerable to the effects of climate change. This is attributable to the characteristics of production structures, the technological features adopted by some production processes, the high proportion of the population that is vulnerable to macroeconomic shocks, the shortcomings of social protection systems, the lack of universal health systems, the high presence of vulnerable ecosystems and a wide variety of biodiversity in the region, and even the initial climatic conditions. The particularity of LAC natural resource endowment and lower historical GHG emissions compared to developed countries, are features that should be considered when outlining the region's strategies in response to climate change.

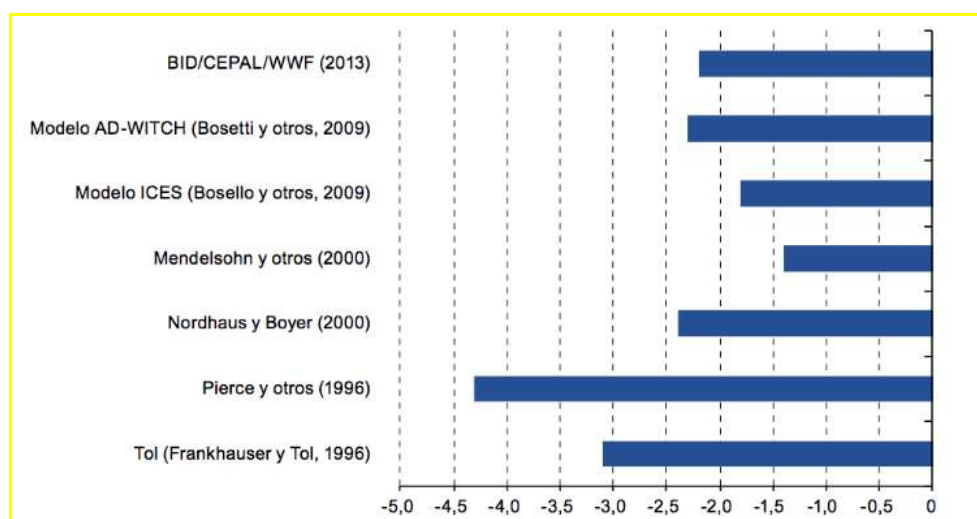
The available evidence shows the presence of a double asymmetry, where Latin America emits less than developing countries but is more vulnerable to the effects of climate change. At the same time, lower-income groups in Latin America are more vulnerable to the effects of climate change and the different types of natural disasters that affect the region but contribute less to greenhouse gas emissions (Figure 6). The lower income groups are generally associated with households with little or no savings capacity and, therefore, have less capacity to accumulate assets. These sectors tend to have a single source of income and a lower educational level, which hinders their insertion into the labor market and reduces their possibilities for labor mobility. In this sense, climate shocks or natural disasters have long-term effects on the economic conditions of low-income groups. The evidence also indicates that there are gender differences in the impacts of climate change that are relevant. That is, climate shocks induce adjustment processes within households where it is common for women to carry significantly higher and disproportionate costs compared with men. For example, school dropout after a natural disaster is higher for women than men. Care overload generally increases more for women, girls and adolescents when reproductive work time increases as a result of these shocks, whether they are droughts, floods, displacements, or loss of livelihoods or housing. This care overload, in turn, affects school dropout rates among girls and adolescents, and the availability of women's time for training or continuing education, as well as their labor market insertion.

Figure 5. Economic costs associated with climate change

a) In the global economy

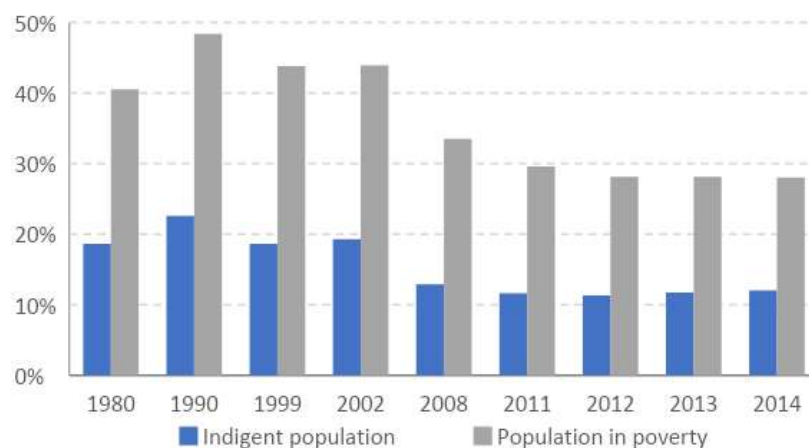


b) In Latin America



Source: Kahn et al., 2020 and ECLAC (2015).

Figure 6. Vulnerable population as a percentage of the total population in Latin America



Source: Authors' elaboration with information from ECLAC (2014).

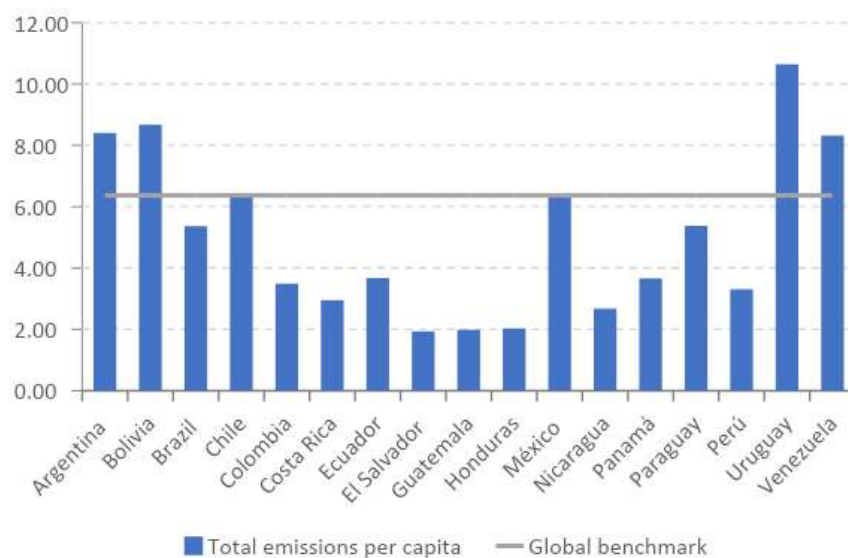
Table 3 shows that the countries in the region show highly heterogeneous GHG emissions. National differences are observed in total *per capita* emissions and in *per capita* energy emissions (Figures 7 and 8). There is a group of countries (i.e. Argentina, Bolivia, Uruguay and Venezuela), for example, with total *per capita* emissions higher than the global average of 4.9 tCO₂eq and another group of countries (i.e. Brazil, Colombia, Costa Rica, Ecuador, El Salvador, Guatemala, Honduras, Nicaragua, Panama, Paraguay and Peru) with *per capita* emissions lower than the global average. These heterogeneities have significant public policy implications, given that mitigation strategies imply, on average, a global average of 5 tons *per capita* by 2030. There are, therefore, countries in the region that are in a position to achieve the mitigation targets proposed in the NDCs if they do not increase their emissions. At the same time, there are other countries that need to reduce their emissions in absolute terms and will have to make significant mitigation efforts.

Table 3. Emissions per capita by country in Latin America (2017).

| Country | Emissions <i>per capita</i> | Growth rate | <i>Per capita</i> energy emissions | Energy emission rates |
|-------------|--------------------------------|----------------|---------------------------------------|--------------------------|
| Argentina | 8,40 | 0,03% | 5,02 | 0,58% |
| Bolivia | 8,67 | 2,98% | 2,29 | 2,94% |
| Brazil | 5,36 | 0,79% | 2,36 | 1,3% |
| Chile | 6,34 | 2,23% | 4,74 | 2,73% |
| Colombia | 3,50 | -0,23% | 2,02 | 0,37% |
| Costa Rica | 2,95 | 0,33% | 1,83 | 3,01% |
| Ecuador | 3,67 | -0,03% | 2,61 | 0,57% |
| El Salvador | 1,93 | 1,61% | 1,23 | 3,52% |
| Guatemala | 1,99 | 1,40% | 1,06 | 2,57% |
| Honduras | 2,03 | 0,35% | 1,11 | 2,86% |
| Mexico | 6,37 | 0,25% | 4,38 | 0,10% |
| Nicaragua | 2,68 | 0,85% | 0,92 | 1,78% |
| Panama | 3,67 | 1,24% | 2,48 | 3,5% |
| Paraguay | 5,38 | 0,67% | 1,07 | 2,2% |
| Peru | 3,31 | 1,5% | 2,19 | 2,64% |
| Uruguay | 10,65 | 0,83% | 2,58 | 3,88% |
| Venezuela | 8,32 | 0,05% | 6,29 | 0,21% |

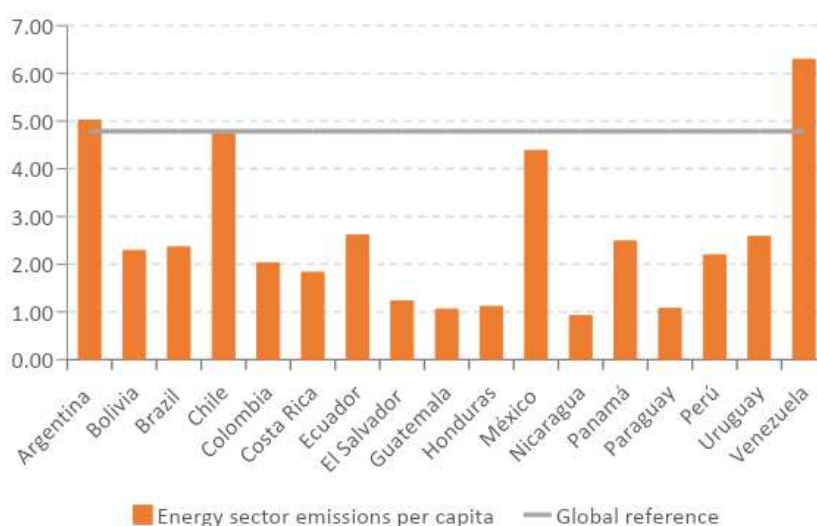
Source: Authors' elaboration with data from PRIMAP-hist national historical emissions time series (2020). Period 2000-2017.

Figure 7. Total per capita emissions per Latin American country in 2017 (tCO₂eq)



Source: Authors' elaboration based on data from PRIMAP-hist national historical emissions time series (2020).

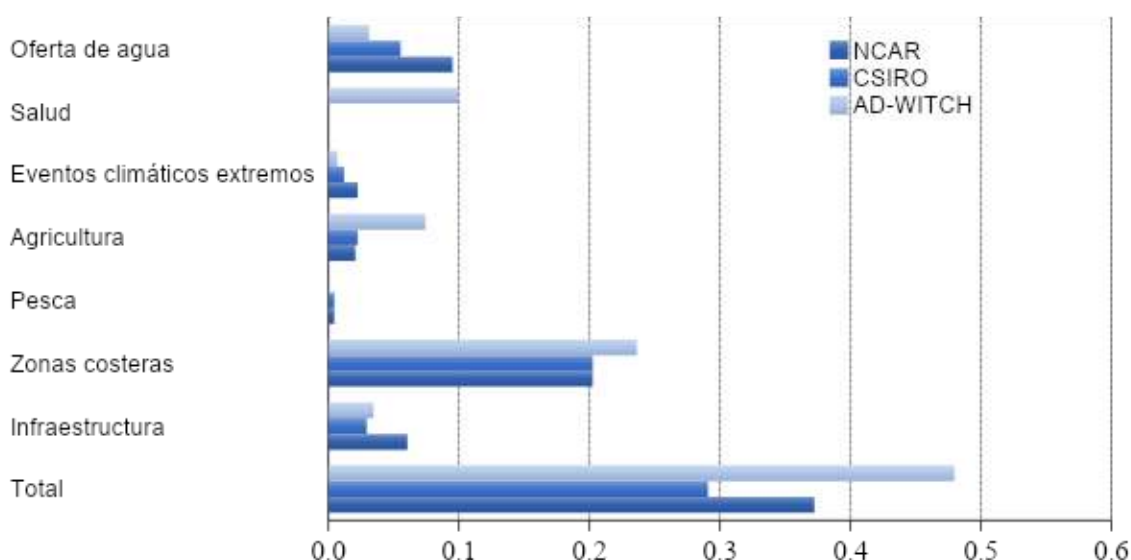
Figure 8. Per capita emissions from energy in selected countries in Latin America in 2017 (tCO₂eq).



Source: Authors' elaboration based on data from PRIMAP-hist national historical emissions time series (2020).

Evidence shows that climate change is inevitable and that it is, therefore, essential to implement a sustainable adaptation process. However, adaptation processes are complex and difficult to properly identify insofar as they involve adjustments as a consequence of changes that are taking place in the climate. In many cases, the required adjustments arise as a consequence of processes that are not directly related to changes in climate. They may, for example, be the result of improvements to the thermal insulation of dwellings that occur as a consequence of increased economic development. Difficulties in properly identifying adaptation processes have hindered the construction of specific indicators and targets. This can be seen, for example, in the NDCs of several countries in the region where adaptation goals and public policies are still diffuse and not clearly determined. As a result, estimates of adaptation costs remain highly uncertain, and there are delays in identifying relevant projects (Figure 9).

Figure 9. Estimated costs of adaptation to climate change for Latin America



Source: BID-CEPAL-WWF (2013).

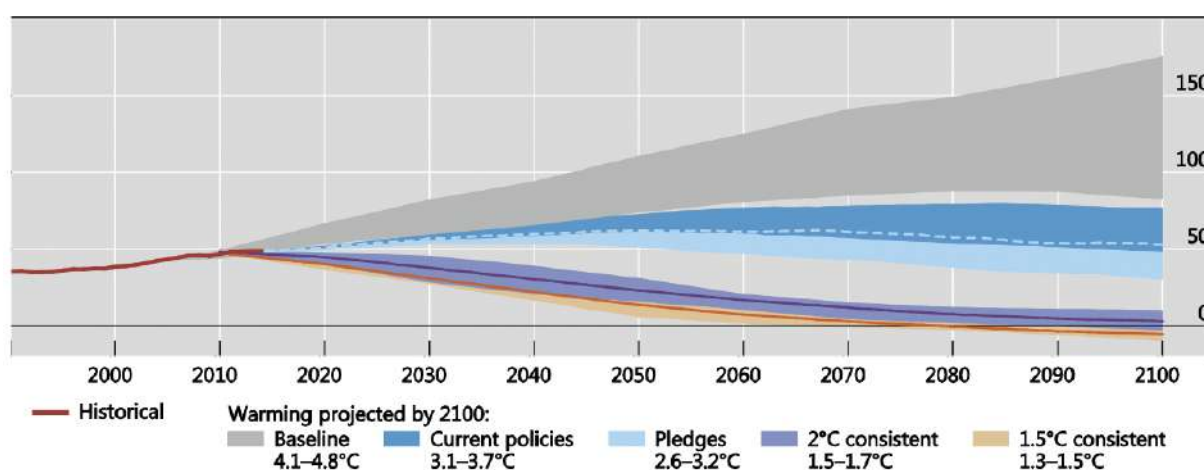
III. COMMITMENTS ESTABLISHED IN THE NATIONALLY DETERMINED CONTRIBUTIONS

Recent evidence shows that current policy scenarios and the commitments established in the Nationally Determined Contributions (NDCs) are insufficient to stabilize the temperature increase between 1.5° C and 2° C (Figure 10). It is, therefore, essential to increase the ambition of mitigation strategies.

Figure 10. Greenhouse gas emissions and temperature increase.

2100 warming projections: emissions and expected warming based on pledges and current policies

Global greenhouse gas emissions (GtCO₂e/year)



Source: Climate ActionTracker.

Latin American countries have, in this regard, proposed a broad portfolio of climate change adaptation and mitigation measures in their NDCs. A variety of measures have been proposed in the region, ranging from the implementation of national energy efficiency plans to land use regulations. However, there are few countries that have included an intensive use of fiscal and market instruments in their national commitments.

Carbon markets and the application of environmental fiscal instruments do not yet have a relevant presence in the strategies of Latin American countries. The NDCs are characterized by a low adherence to market mechanisms, with no plans to create carbon markets at a national level, nor are they considering the use of international markets. Only nine countries declare interest in the use of domestic carbon markets (Black-Arbeláez, 2017). Additionally, fiscal instruments - taxes or subsidies - are not intensively used. Only a few countries have committed to public policy actions that include taxes or subsidies, with Mexico (emissions tax) and Chile (emissions taxes and fees on vehicles with high emissions) and Colombia standing out.

Some of the countries in the region have assumed relatively ambitious contributions. The largest economies have proposed measures that would bring them to levels equal to or less than 5 tCO₂e *per capita* of GHG emissions by 2030. Other methodologies for measuring the proposed effort show reductions of 20% and 51% for Mexico and Brazil, respectively, when comparing the NDC target for 2030 versus 2010 emissions. When comparing the committed target with the projected trend for 2030, the GHG emission reduction efforts proposed by Chile, Mexico, Colombia, Peru and Argentina stand out. These economies have proposed reductions of between 30% and 15% (Black-Arbeláez, 2017).

Latin America's NDCs exhibit a high level of heterogeneity between countries. The relative importance of the commitments assumed in each sector (expressed in terms of adaptation and mitigation efforts) is specifically determined by each country, based in general on the capacity to reduce GHG emissions, the impact of climate change on the country's productive base and the opportunity to improve the living conditions of its inhabitants.

In general, NDCs related to climate change adaptation are concentrated in the sectors of water, forestry, infrastructure, human settlements, agriculture, biodiversity, health and energy. Additionally, the analysis of the commitments undertaken indicates that there is a special emphasis on those sectors or populations that are directly affected by the occurrence of extreme events (Reyes and Sanchez, 2015). The aim of the water sector is to ensure the effective supply and distribution of water, mainly to the most vulnerable populations and productive activities. Also noteworthy is the support for research, information and training on climate change.

Most of the NDCs related to climate change mitigation are concentrated in the sectors of energy, transportation, agriculture, land use change, forestry and forestry. In terms of mitigation efforts, the countries of the region mention most of the sectors recommended by the United Nations Framework Convention on Climate Change. Most countries have adopted or are committed to adopting clean development mechanisms (CDM) to promote projects of greater efficiency and changes in the energy matrix to reduce GHG emissions. In addition, mechanisms have been implemented to reduce emissions from deforestation and forest degradation (REDD+). Green funds and trusts have also been established to finance different mitigation measures through the acquisition of new technologies.

The countries of the region do not precisely define the areas and sectors in which GHG emission reductions would materialize. Some of the NDCs only list the sectors in which reductions are expected to be achieved but do not specify the stages of the production processes in which action will be taken to achieve the mitigation targets. In this sense, the NDCs seem to be an expression of desire rather than a measurable and potentially binding commitment.

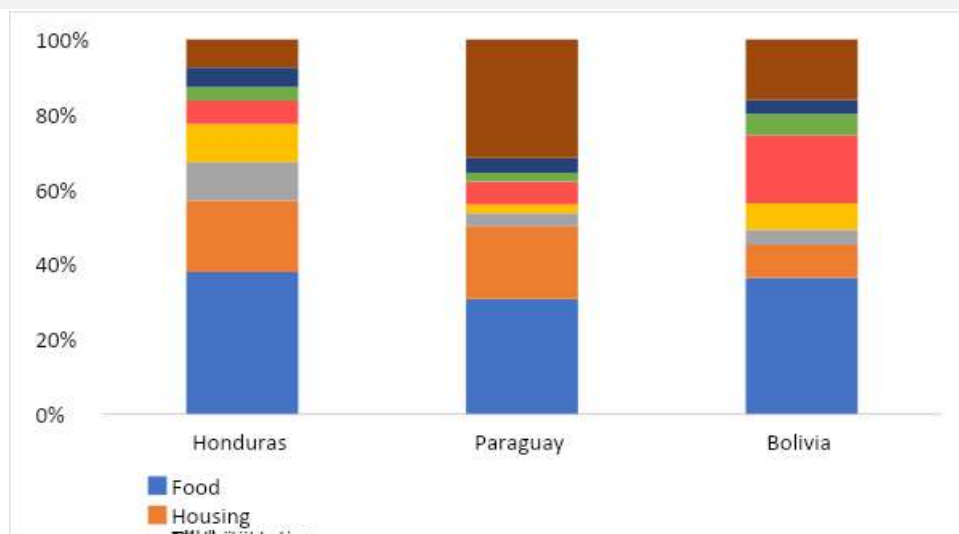
In the NDCs, the countries do not establish strategies for the fulfillment of the commitments, and it is not possible to establish a direct correspondence between, on the one hand, economic policy instruments, in general, and fiscal policy, in particular, and on the other the goals proposed in the contributions. The NDCs make no reference to what tools would be used to achieve their objectives. Some countries declare their willingness to resort to market mechanisms, at a national or international level, as a means of mitigating CO₂ emissions. However, there are no other references to concrete tools in terms of economic policy (regulations, information campaigns, etc.) and, even less, fiscal policy (taxes, subsidies, etc.).

IV. CONSUMPTION PATTERNS AND CLIMATE CHANGE

Increasing the ambition of the Nationally Determined Contributions requires implementing structural transformations in the current style of development as illustrated by current consumption patterns.

The main components of household consumption expenditure in Latin American countries correspond, in general, to food, transportation, electricity, housing, education and health. Figure 11 shows, however, that countries show differences in characteristics and particularities that are far from irrelevant. The existing heterogeneities in the consumption structures of the different countries may have implications in terms of the characteristics of GHG emissions and changes in consumption patterns that are needed to meet the challenges of climate change.

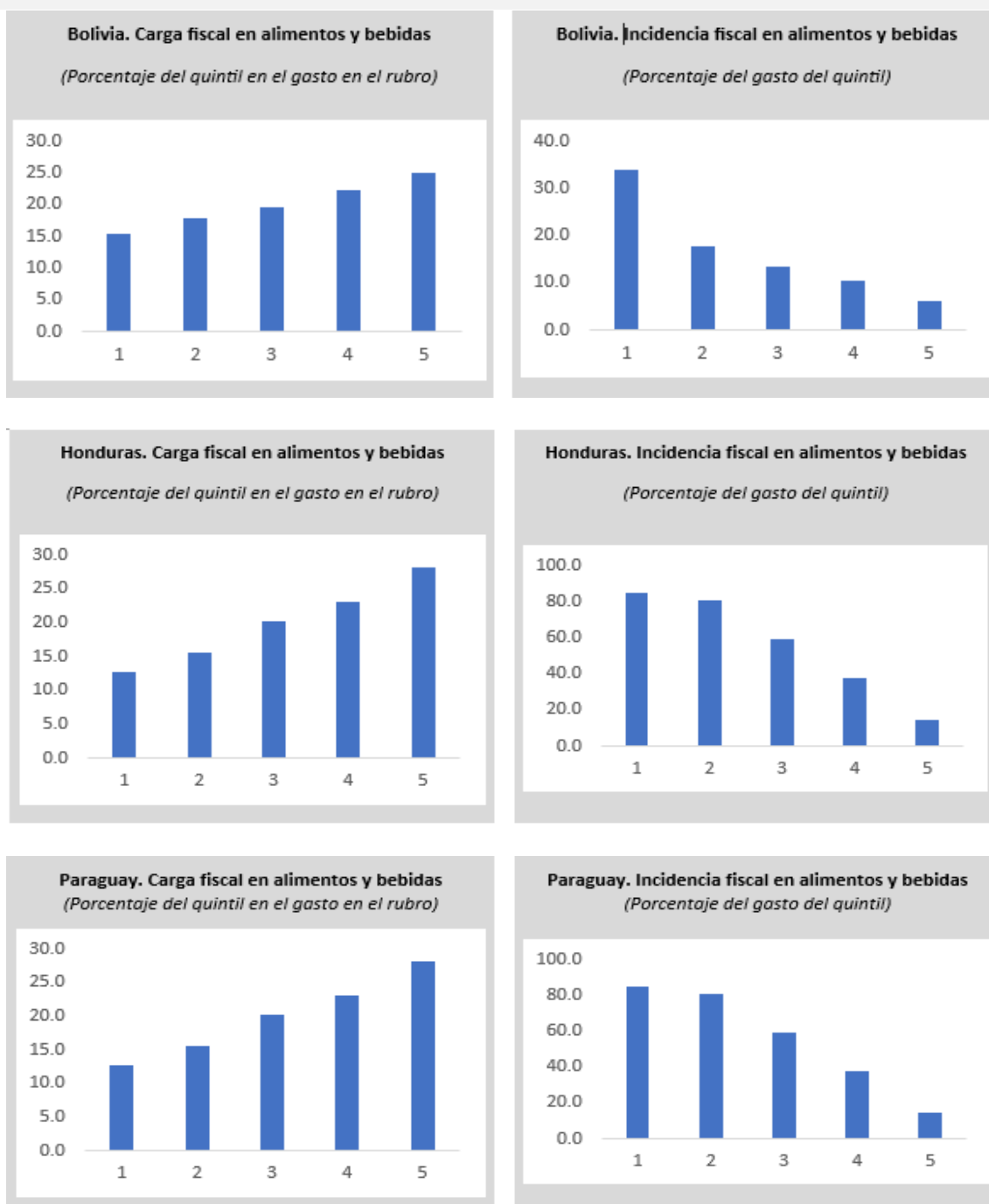
Figure 11. Structure of Household Consumption Expenditure (selected Latin American countries)



Source: Authors' elaboration based on data from Honduras' 2021 Household Survey, Bolivia's 1999 National Household Income and Expenditure Survey (ENIGH) and Paraguay's 2011-2012 Income and Expenditure and Living Conditions Survey (EIGyCV).

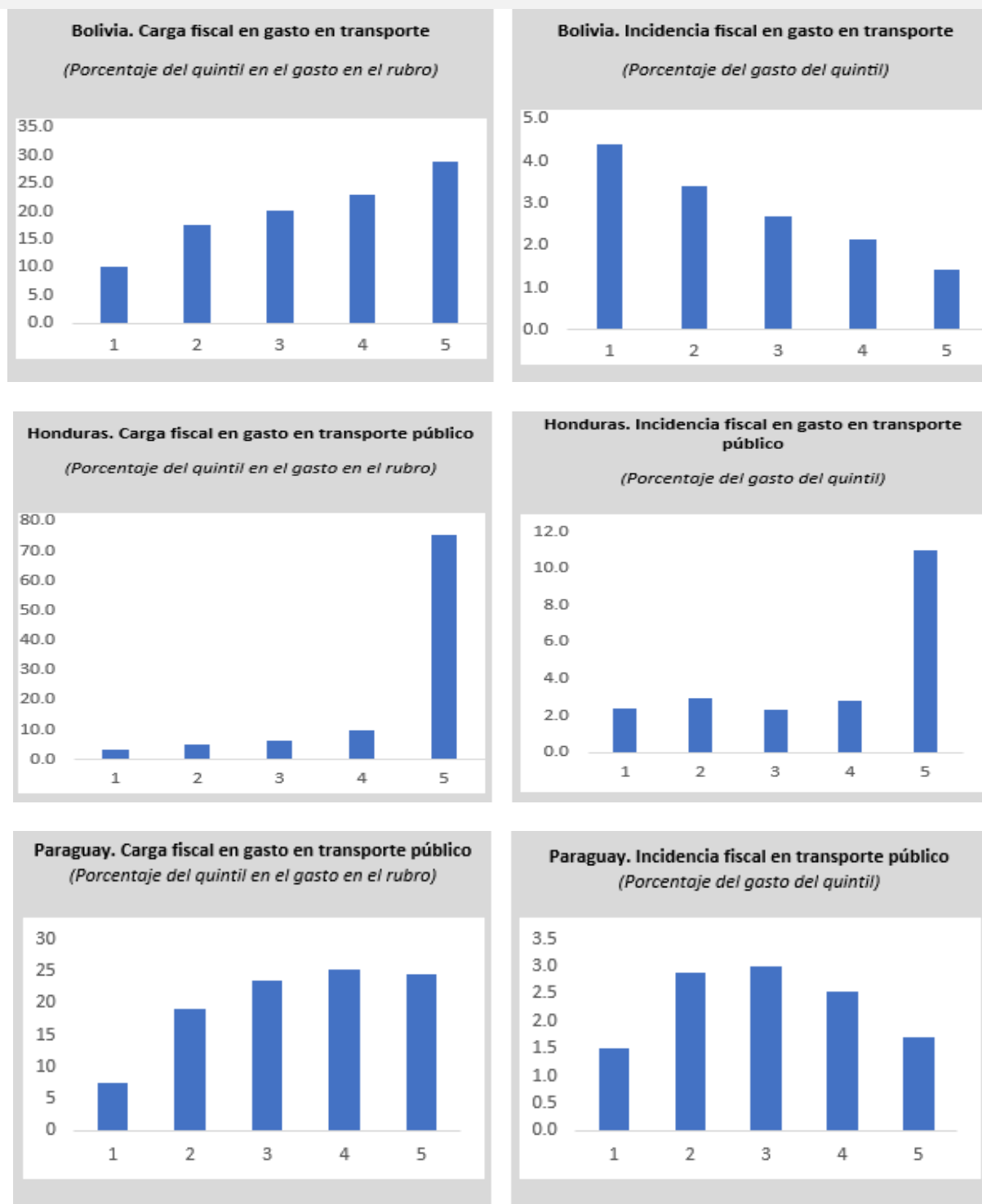
Current consumption patterns show a decrease in the share of food expenditure in total expenditure by income group (quintiles) when income increases (Figure 12). These new consumption spaces are covered by an increase in spending on private transportation (fossil fuels and automobiles), private education, private health and household appliances. This reflects a migration process from public transportation to private transportation, from public health to private health, and from public education to private education because of the growing dissatisfaction with the quality and services offered by these public services (Figure 13). This creates a society that is increasingly segmented and where, based on a greater use of private transportation, the fulfillment of mitigation goals is more difficult.

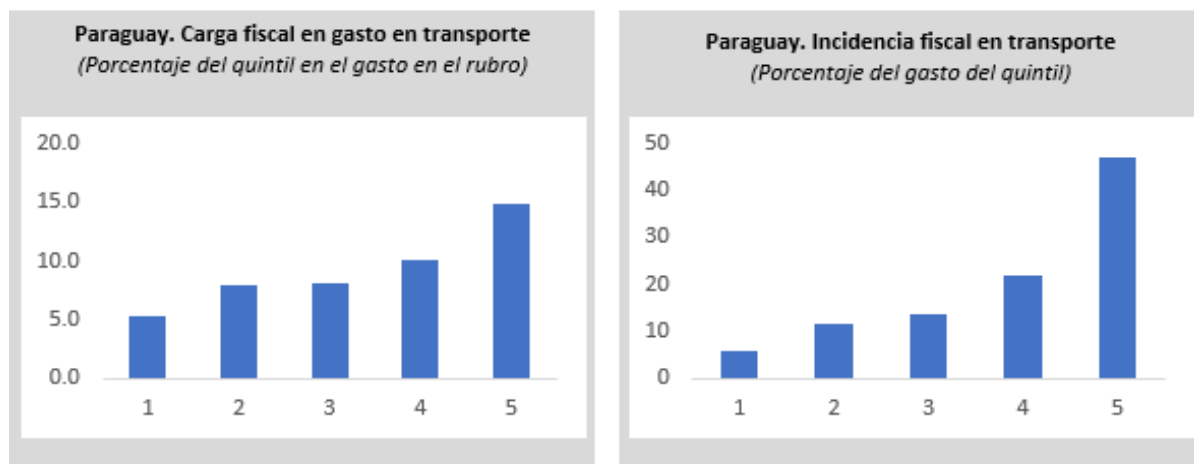
Figure 12. Tax burden and incidence on food and beverage expenditures (selected countries in Latin America)



Source: Authors' elaboration based on data from Honduras' 2021 Household Survey, Bolivia's 1999 National Household Income and Expenditure Survey (ENIGH) and Paraguay's 2011-2012 Income and Expenditure and Living Conditions Survey (EIGyCV).

Figure 13. Tax burden and incidence on transportation spending (selected Latin American countries)





Source: Authors' elaboration based on data from the 2021 Household Survey of Honduras, the 1999 National Household Income and Expenditure Survey (ENIGH) of Bolivia and the 2011-2012 Income and Expenditure and Living Conditions Survey (EIGyCV) of Paraguay.

V. ENVIRONMENTAL TAXATION'S INSTRUMENTS

Environmental tax instruments are economic policy tools that are introduced with the explicit purpose of influencing the decisions of economic agents to correct the externalities generated by their actions, and to ensure that market price signals reflect the social losses associated with the depredation - or destruction - of a given environmental resource. This type of intervention aims at making sure that market prices consider the social costs and benefits that are associated with the adoption of certain forms of production or consumption of goods and services that are produced from resources whose preservation is considered desirable from the point of view of the general interest.

By means of their effects on relative prices or on private profitability, taxes that are introduced for environmental purposes seek to modify the behavior of agents in order to align them with the objectives of preserving a given environmental asset. When this type of instrument is used, the aim is for agents to internalize the social costs and benefits of their actions. This is achieved by making agents pay for the damage they cause to the environmental resource. The idea behind this type of intervention is based on the corrective taxation that was proposed by Pigou (1938). These tax modalities intend for the tax rate to be set in such a way that the amount paid by the taxpayer reflects the economic value of the externality to be corrected (Baumol and Oates, 1988; Rosen and Gayer, 2009).

The economic instruments (tax and fiscal) have the following characteristics.

- They provide sufficient flexibility so that each agent can determine its behavior considering their own marginal costs.
- They minimize individualized information requirements on the costs of reducing the externality for each of the agents (although there may be problems with asymmetric information).
- They generate incentives for agents to adopt appropriate (clean) technologies and productive innovations that mitigate externalities.
- They make it possible to tax the agents who cause pollution from the first unit of environmental pollution they generate.
- They facilitate symmetrical and generalized treatment of the agents who cause the externality since they all face the same penalty structure, regardless of their technological and productive characteristics (individual negotiations with regulatory entities are eliminated).
- They generate revenues for the State that help finance actions aimed at acting on the consequences of the externality generated by private parties.

V.1. INSTRUMENTS' TYPOLOGY

Environmental taxes are specifically designed to impact the price formation of goods, services and production factors. Within this type of interventions, a wide range of mechanisms can be identified: direct and indirect taxes, subsidies, charges, fees, payments for environmental services, etc. (Smith, 1992; Ekins, 1997; Bosquet, 2000; Helm, 2005; Endres, 2011; Ekins and Speck, 2011; Speck and Gee, 2011). Schematically, tax instruments can be grouped as follows:

Taxes or fines, which are levied on the very substance of the environmentally damaging activity or which are levied on the consumption of goods whose use is directly related to the factor causing the environmental damage.

Charges and fees, which are levied for the use of environmental resources or services they provide. These taxes are intended to finance the operating costs of preserving environmental assets (such as water supply or waste management). Under certain circumstances, this type of intervention may take the form of tax incentives (reduced rates, exemptions, accelerated depreciation), which are intended to prevent abuse by private agents and thus avoid environmental damage before it occurs.

Subsidies and subventions, which generally take the form of incentives aimed at promoting activities with positive environmental externalities.

The OECD, the European Union and the International Energy Agency specifically define environmental taxes as those compulsory payments whose tax base negatively affects the environment. According to the definitions adopted by the European Union, four groups of environmental taxes can be identified depending on the tax base considered:

- i) Energy taxes, which include both fuels used for transportation (e.g. diesel, gasoline) and for other uses such as natural gas and electricity consumption.

- ii) Carbon (CO₂) taxes, which are levied on the ownership or use of transportation vehicles.
- iii) Pollution taxes, that are levied on the discharge of polluting substances into the air and water, on waste management and on noise pollution.
- iv) Taxes on the use or extraction of natural resources and materials.

When designing and applying environmental tax instruments, it is necessary to consider that there are circumstances in which the application of this type of instrument presents difficulties.

In the first place, there are cases in which taxes are not the best instrument of environmental policy since an explicit prohibition of a certain activity might be more appropriate. This is the case when penalizing actions or behaviors that put people's health at risk or when the costs of pollution mitigation are extremely high, are concerned.

Second, the use of taxes can be inconvenient when there are significant variations in the levels of pollution associated with different generating sources. The application of a uniform, easily designed tax rate, without differentiating by pollution source, may be inadequate and lead to inefficient results from the viewpoint of correcting the externality. It may possibly be very difficult to set specific rates distinguished by source type and it may give rise to forms of evasion, and avoidance that are difficult to control.

Thirdly, it is likely that in the absence of effective control mechanisms, an environmental tax may encourage undesired behavior in order to avoid paying said tax. This could be the case of the disposal of toxic waste through procedures that damage health or the environment itself.

Finally, the application of taxes may be inadvisable if it generates undesirable distributive effects. This could be the case when expenditures on electricity, fuel, heating or transportation represent a higher proportion of the expenditures of lower-income households than those of the wealthier strata of the population.

Subsidies, on the other hand, seek to encourage behaviors that cause positive externalities. The rationale for their use is that it is possible to influence the behavior of individuals through explicit monetary transfers so that they adopt production technologies, for example, or consumption structures that have positive or less harmful effects on environmental resources. It should be pointed out, however, that subsidies are not only used to encourage exact or specific behaviors, but can also reduce the cost of investments aimed at a more responsible use of environmental resources, or stimulate companies to directly carry out or financially support, research activities in areas of knowledge that are considered important from an environmental point of view.

One of the frequently used subsidy types is the so-called "payments for environmental services" (PES). The use of this type of instrument is based on the fact that there are natural resources that, by their mere existence, provide benefits to society, but for which the owners are not receiving any economic compensation. It is, therefore, an instrument that seeks to generate an income for the owner of the resource that economically reflects the benefits received by other individuals or by society as a whole. These payments contribute to the preservation of the environmental asset.

This idea is easily applicable to the use of a wide range of environmental resources, including land use for agricultural activities. If landowners do not receive economic benefits from a "benign" use in terms of environmental impacts, they will be more inclined to seek resource uses that generate higher income. To this

end, it is reasonable to assume that they will be willing to take on greater risks in terms of possible negative impacts on the environment. Ultimately, the PES aims to compensate the resource owner in order to promote an adequate and sustainable use of environmental resources.

V.2. CARBON PRICING AND TAXATION

Carbon pricing aims to ensure that the damage caused to the environment by GHG emissions is assumed by the agents responsible for the damage, thus shaping a new incentive scheme that is compatible with the elimination of distortions in the allocation of resources that are generated by the negative externalities associated with climate change. The rationale behind carbon pricing is, on the one hand, to provide a signal for decision-making by economic agents and, on the other hand, to establish fiscal mechanisms that they internalize so that they can decide to adjust their forms of production and consumption "to their own convenience" and thus avoid paying higher costs (carbon tax). Carbon pricing, therefore, achieves the environmental objective in a more flexible and less costly way for society and is compatible with technological and commercial innovations that are low in GHG emissions.

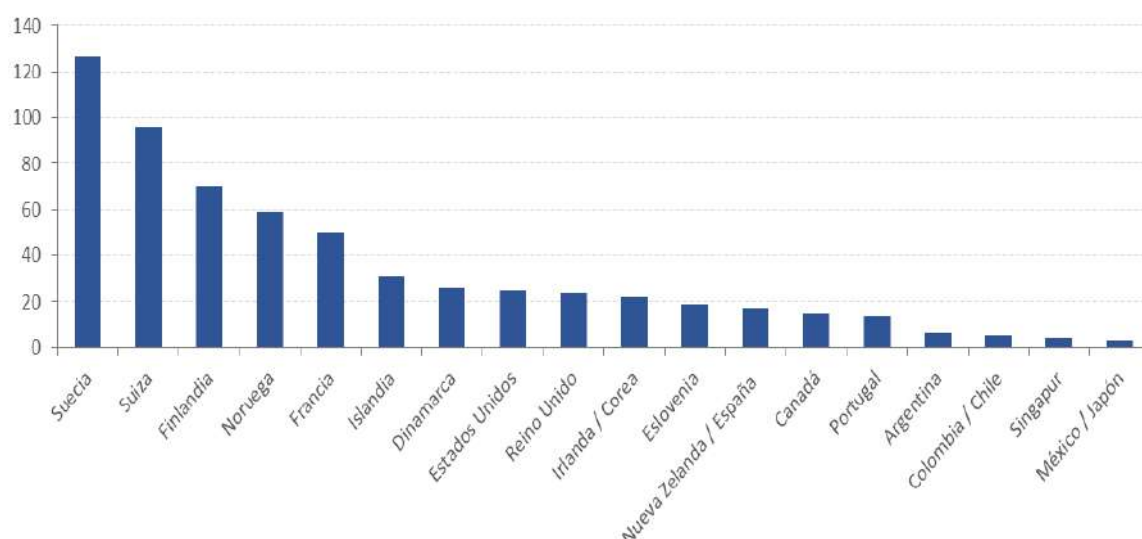
Thus, all the available alternatives for establishing a carbon price begin by identifying the negative externalities associated with carbon emissions (health problems for the population, damage to crops caused by heat waves and droughts, or economic damage from flooding and rising sea levels, among others) and attempt to link these costs to their sources, through a carbon price. There are also other ways of determining the price of carbon that correspond, for example, to the cost of mitigating a ton of carbon or to the price of carbon needed to achieve climate mitigation targets.

In practice, there are two main mechanisms:

- **Systems for trading permits or transferable emission rights.** In this case, carbon pricing arises from the establishment of a ceiling on the total level of emissions of gases that contribute to the "greenhouse effect". After this, a free exchange of emission rights between companies (in exchange for economic compensation) is allowed, and this favors the free play of supply and demand mechanisms and indirectly favors the configuration of a "market equilibrium price" for GHG emissions (the quantity of emissions is fixed and the market is allowed to determine the price).
- **Establishment of taxes on emissions and on energy consumption.** Carbon taxes directly establish a price on this component by defining a tax rate on GHG emissions – or, more commonly, on the carbon content of fossil fuel consumption - which gives rise to a carbon pricing scheme substantially different from that which would arise from a system of transferable emission rights insofar as the outcome in terms of reduction of polluting emissions is not predefined (the price is set and the market determines the environmental outcome).

A carbon (CO₂) tax consists of applying a tax rate on the price of all forms of fossil fuel use (oil, coal and natural gas), depending on their degree of emission (defined in tons of CO₂). The tax is totally or partially passed on to consumers and is reflected in the price of electricity, gasoline and any other type of energy-intensive products or services. Figure 14 shows the magnitude of some of the specific carbon taxes currently applied.

Figure 14. Carbon tax per tCO₂ e (in USD)



Source: Authors' elaboration based on information from the World Bank (2019).

From the perspective of consumption, the effects of a carbon tax have both direct and indirect impacts. The main **direct effect** of carbon taxation is to increase the relative prices of carbon-intensive goods in order to discourage their consumption (induce a reduction in demand). The **indirect effects** involve stimulating the use of cleaner fuels and renewable energies, encouraging the demand for less carbon-intensive products (promoting substitution).

There is evidence that poorer households generally spend a larger share of their income on energy than higher-income households so that an increase in carbon price would imply an increase in energy costs, which would have regressive effects from the point of view of income distribution. Alternatives to mitigate these effects require the transfer of a certain percentage of the revenues generated by the carbon tax to low-income households (in order to compensate for the increase in energy costs). This indicates the importance of fiscal recycling processes.

On the other hand, carbon pricing could put energy-intensive industries exposed to international competition (such as chemicals, cement, concrete and steel) at a disadvantage vis-à-vis foreign suppliers that do not face an equivalent price. In this regard, a change in the demand structure could, on a global scale, result in "emissions leakage" from one country to another, reducing the climate benefit of carbon pricing. For these reasons, all existing carbon pricing programs include mechanisms to address potential effects of competitiveness and take historical emissions-based allowances, output-based allowances, exemptions for selected sectors, and rebates into account.

Available estimates indicate that a carbon tax could raise tax revenues significantly. How that revenue is used will ultimately be a policy choice, although some (or all) of it could be returned to consumers as a

"dividend" of sorts. In this way, the additional funds resulting from the tax collection could be reinvested in high-impact climate projects, such as advancing low-carbon technologies or building greater resilience into production systems. Economic research suggests that using revenues to reduce existing taxes on labor and capital, also known as a tax swap, can minimize economic costs and can result in net economic benefits.

In the design of a carbon tax, the following aspects must be taken into account:

Coverage. The scope of the carbon tax depends on the substances covered (e.g. it could be applied on the carbon dioxide content of fossil fuels).

Point of taxation (taxable person). A carbon tax can be levied at any point in the energy supply chain, with administratively speaking, the simplest approach being an *upstream* collection, where the supplying entities would be subject to it (e.g., coal suppliers, natural gas processing facilities and oil refineries). *Midstream* (electric utilities) or *downstream* (energy-using industries, households or vehicles) alternatives could also be considered.

Establishment of rates. There are several methodologies to determine specific carbon tax rates, among which the following stand out:

- Determination based on current carbon prices.
- Estimation of the social cost of carbon from integrated models of analysis (Nordhaus, 1994) or from models of the new climate economy (data from a meta-analysis can also be used).
- Construction of abatement cost curves and specific studies on the costs of mitigating GHG emissions.
- Determination of the carbon price required to achieve specific mitigation targets.

The implementation of available methodologies requires the estimation of parameters of the demands of polluting product (price and income elasticities), the analysis of the consumption patterns of the different strata of the population, the specification of production or cost functions (input-output) and the analysis of various types of microeconomic data.

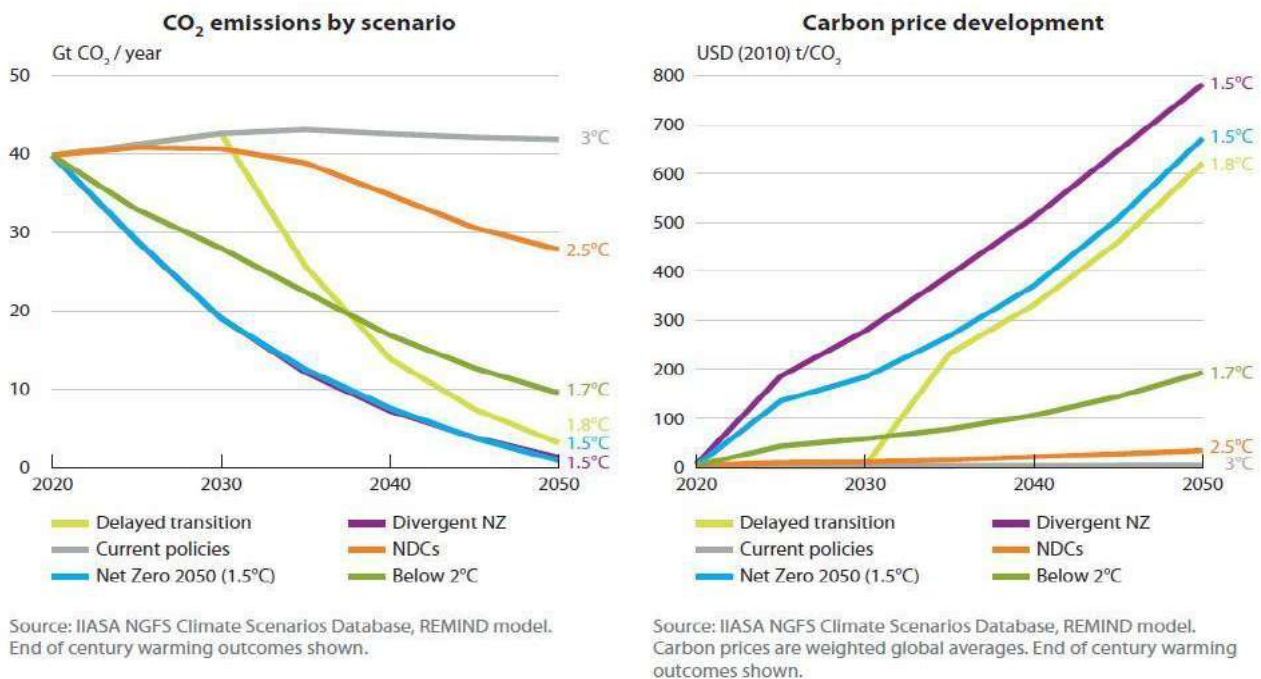
These methodologies show that:

- The application of a carbon price based on current carbon prices suggests a wide heterogeneity at the global level, but in Latin America, they are below USD 5 tCO₂e. In the case of Latin America, these carbon prices seem insufficient to meet the challenge of climate change.
- Economic theory suggests that a carbon tax should be set equal to the **social cost of carbon**, which is the present value of the estimated environmental damages over time caused by an additional ton of carbon dioxide emitted into the atmosphere. Estimates of the Social Cost of Carbon (SCC) indicate a value of around USD 25 tCO₂e and USD 30 tCO₂e as a current value, which is highly likely to increase in the coming years. Some estimates suggest a carbon price of between USD 40 tCO₂e and USD 80 tCO₂e (IPCC, 2018a), for example. In this case, the carbon price reflects that the tax rate should increase over time if it is to reflect the expected increasing damage due to climate change. An increasing (pre-announced) trajectory of the carbon tax rate would provide a signal to

emitting agents that, if they postpone adjustments in their emission levels, they will have to make a greater effort in the future and that their new investments in cleaner technologies will be economically justified.

- Estimation of the carbon price considering the mitigation costs of a ton of carbon by sectors and economic activities. These estimates are heterogeneous as they usually consider country-specific conditions for specific mitigation costs.
- Estimates of the carbon price considering the level required to reach a carbon-neutral economy between 2050 and 2070 (Figure 15). This carbon price grows over time since higher costs are gradually required to reach the necessary mitigation levels.

Figure 15. NGFS Scenario: Emissions and price to CO₂e



These carbon prices should allow GHG emission reductions to be projected from a specific tax rate. Adopting a design that foresees the revision of rates and the way in which adjustments are made in advance can make an important contribution by providing certainty during the climate transition. However, the fact that there is no certainty today about the level of the carbon price in the future should not be overlooked.

VI. ENVIRONMENTAL TAX REFORMS

The arguments in favor of the introduction of environmental taxes seek to demonstrate that the use of this type of tax instrument offers benefits in terms of efficiency that go beyond their impact on the environment. The reasoning emphasizes that the adjustments in the forms of production and consumption resulting from the application of these tax modalities would not only generate benefits in terms of preserving natural resources but would also have a broader positive impact on the use of resources at the level of the economy as a whole.

The logic of this line of argument is based on concepts originally developed by Pigou (1920, 1938), who considered that taxes should help economic agents to absorb the social costs of the environmental externalities caused by their actions. The idea is that the benefits perceived by economic agents should effectively reflect the alignment between the private cost and the social cost of their behaviors. By correcting an externality, interventions inspired by the "Pigouvian" argument influence prices, correcting distortions that move market equilibria away from "optimality" criteria, consistent with an efficient allocation of resources from the point of view of the general interest.

It could also be argued that corrective environmental taxes would contribute to reduce the dependence of revenue collection on other regressive taxes, such as VAT, or the reduction of the tax burden from inefficient taxes on wages and employment so that the introduction of environmental taxes inspired by this argument could be understood as an improvement in the efficiency of the tax system as a whole. The strict application of a "Pigouvian" logic would imply that the cost of the environmental tax could be zero, or even negative when the effect of reducing or eliminating other distortionary taxes is considered. The underlying idea is related to the argument about the "multiple dividends" resulting from the use of this type of tax tools, whose pioneering developments can be found in the works of Goulder (1994), Oates (1995) and Bovenberg (1999), who highlight the importance of the "double dividend" resulting from environmental tax policy.

What makes this idea attractive is that environmental taxes would offer an alternative to mitigate the reactions that often when new forms of taxation are created. If tax reforms were designed, for example, to ensure "neutrality" in terms of total revenue, the incorporation of environmental taxation would contribute to improve environmental preservation outcomes and, at the same time, generate a tax system with fewer distortions. This argument also aims at ranking the complex political economy dimensions of tax reforms of any kind. If a tax innovation, in addition to benefiting society as a whole, improves the efficiency of the tax system, then only the taxpayers directly affected might resist its implementation. If the benefits for society as a whole were evident, it would be difficult for the sectors affected by environmental taxes to impose their views on the rest of society.

On the other hand, it should not be overlooked that environmental taxes have distorting effects on labor markets and consumption patterns, affecting the decisions made by individuals (Albrecht, 2006). For their part, Bovenberg and De Mooij (1994) show that in most cases, the use of these tax tools could even exacerbate pre-existing distortions in tax systems instead of reducing them. It does not seem at all evident, then, that the case for environmental tax reforms can rest exclusively on efficiency considerations that help to eliminate or mitigate the traditional political economy problems of tax reforms. The "double dividend" argument is thus far from axiomatic.

VI.1. RELEVANT EXPERIENCES

During the 1990s, several European Union countries introduced environmental tax reforms (ETR) that promoted the use of taxes to generate a style of economic development that would promote employment generation and environmental preservation (Fanelli, Jiménez and López Azcúnaga, 2015). The basic idea behind this type of initiatives was to use price mechanisms because of their ability to provide information and influence incentives to correct the distortions that deteriorate the environment and cause climate change. Following the "polluter pays" principle, the ETR sought to ensure that prices incorporated the social cost of negative externalities, and the instrument proposed to achieve this was "Pigouvian" taxes.

Most of these reforms, which were implemented during the 1990s, were conceived as part of comprehensive processes to transform national tax systems. They were aimed at reducing labor costs, broadening the tax base of some indirect taxes and creating taxes specifically designed to meet environmental objectives. The implementation strategy of these reforms was based on the introduction of new taxes on energy consumption and CO₂ emissions, the revision of existing taxes on the use of energy districts and the reduction of income taxes and labor costs. The latter, with the purpose of maintaining the neutrality of the reform in terms of revenue. This experience was extended to other OECD member countries at the beginning of the 21st century.

The analysis of these experiences makes it possible to identify four generations of ETRs. The first generation, implemented during the 1990s, took place in northern European countries such as Finland (1990), Sweden (1991), Norway (1992), Denmark (1994) and the Netherlands (1995). The tax changes mainly concentrated on the creation of energy taxes. These tax innovations generated a significant amount of fiscal resources, which were used to reduce income taxes. The new tax burden fell mainly on final consumers.

The second generation of reforms took place in Finland (1997), Germany (1999, 2003) and the United Kingdom (1996, 2001). On this occasion, although the tax instruments applied were similar to those used in the first generation, the revenue increases generated were used to reduce the social security contributions of workers and employers. In this new reformist wave, fiscal recycling measures were applied to compensate the sectors affected by the tax changes. In this way, the aspiration was to simultaneously control the negative externality and promote employment, which was defined as a "double dividend".

The third phase of the ETRs, which was developed in Ireland and Australia, included a wider variety of taxes, for example, on solid waste, and adopted a less rigid vision where no specific destination was assigned to the tax revenues generated by the new tax instruments.

The fourth generation of reforms is the most recent and incorporates the experience of the previous ETRs. In this instance, intensive use is made of fiscal recycling processes, specific taxes are created, and these are combined with subsidy schemes and the issuance of green bonds. The latest environmental taxes are concentrated on energy products, motor vehicles and activities that generate pollution of water resources and various types of waste.

The experiences with the ETRs that took place in European countries are a reference for Latin America, both for the lessons learned regarding the design of environmental taxes as well as for the efforts made to avoid undesired impacts on income distribution and competitiveness.

VI.2. MITIGATION OF DISTRIBUTIVE EFFECTS

Tax instruments have distributive impacts insofar as they alter income levels and user and consumer behavior. Within the framework of ETRs in particular, governments often modify taxes on certain goods and services that are consumed by the lower-income strata of the population, and this can lead to regressive impacts from a distributional point of view. The political viability of the reforms requires mitigating these effects by resorting to complementary adjustments in the tax structure and the implementation of policies and programs specifically designed to compensate vulnerable sectors.

Three interrelated aspects must be considered when assessing the impact of the application of environmental fiscal instruments on income distribution. The first is related to the way in which, prior to the introduction of changes in the tax structure, the tax burden is distributed among the different sectors of society. The second relates to the determination of the effects these different taxes to be included in the new tax structure have on the income and consumption of the different sectors of society (households, regions, factors of production, sectors of the economy, etc.). Finally, it is essential to determine who benefits from environmental improvement. This is perhaps the most complicated aspect because it involves both the consideration of the distribution of benefits and the evaluation of avoided costs. Regarding these aspects, it is possible to mention some empirical regularities that help to understand the nature of the distributional effects involved in environmental fiscal reforms.

Green taxes are usually levied on transportation, fuel, energy generation (mainly electricity) and water. These items account for a significant proportion of household budgets. However, while taxes on water consumption generate a higher tax burden on lower-income households, taxes on private motor vehicles and their fuels tend to fall more heavily on middle- and high-income households. The way in which the burden of taxation on electricity and natural gas is distributed among households depends on each national reality. In some European countries, the application of taxes on energy consumed by households had regressive effects, while in the region's countries, the use of these instruments seems to have opposite distributive effects, similar to those of taxation on fuels.

The concern about regressively affecting income distribution has led governments to implement special or subsidized tariffs on the consumption of certain basic goods in order to reduce the burden on lower-income households. However, addressing an environmental and distributive problem with the same instrument affects the effectiveness of the tax as an incentive for the efficient use of resources.

Regressive effects were addressed on the basis of a comprehensive view of the tax system in the countries where ETRs were carried out. Thus, instead of evaluating the distributional impact of each tax in particular, an attempt was made to ensure that the tax reform as a whole did not have adverse distributional effects. In other words, in the presence of negative distributive effects from the introduction of a given environmental tax, the aim was to compensate lower-income households with other instruments. The logic of successful reforms implied maintaining incentives for the efficient consumption of environmental resources while avoiding harmful effects on equity in income distribution.

The green tax reform in Germany was based on the introduction of taxes on fuel and electricity, with only a few exemptions for energy-intensive industries. As a way to neutralize the regressive impact of the application of these taxes, exemptions on specific consumption taxes were introduced, and complementary fiscal measures were implemented, allocating the revenue related to green taxes to compensate for reductions in both individuals and employer's social security contributions and to a lesser extent, to finance

renewable energy projects. The evaluation of the impact of this reform is mixed. Although labor costs were reduced, thus providing an incentive for job creation, part of the tax burden was also transferred from industry to households. Available studies indicate that the impact on income distribution at the aggregate level was regressive, although its magnitude was not very significant. The greatest negative effects fell on the poorest households, where unemployment had the highest incidence. To mitigate this effect, a direct benefit was established that automatically compensated part of the increase in the cost of heating for lower-income households.

In Sweden, the mechanism to neutralize the impact on income distribution was based on the reduction of income tax and, to a lesser extent, on the reduction of the employer's labor tax. The "*green tax shift*" program was implemented in 2001 and intended to shift 3.3 billion euros from income and labor tax revenues to environmental tax revenues over a period of 10 years, thus operating in a neutral way in terms of total revenues. By 2004, a positive impact on income distribution was identified, but of small magnitude, amounting to slightly less than 1% tax relief for households (European Environment Agency, 2011).

VI.3. MITIGATION OF IMPACTS ON COMPETITIVENESS

The application of environmental taxes on industries, broadly speaking, seeks to make companies assume the effects of pollution, generating incentives to develop more environmentally sustainable production chains. However, the imposition of taxes on polluting activities may entail costs that deteriorate the profitability and competitiveness of companies.

The introduction of complementary actions to mitigate the effects on competitiveness faces two types of limitations. First, the World Trade Organization (WTO) imposes strict rules on subsidies and tax refunds for internationally traded goods which restricts the range of options available in this area for national governments. Although it is possible to establish some countervailing measures within the WTO regulatory framework, their implementation and enforcement are extremely difficult. Secondly, it should be borne in mind that the compensation for the affected companies in terms of competitiveness is associated with a reduction in the incentive generated by the environmental tax. Thus, part of the main reason for applying the tax is lost.

Taxes applied for environmental purposes can influence the location of productive activities, leading to a concentration of companies in areas that are not subject to environmental regulation. In fact, the existence of significant differences in environmental regulations, not only in terms of tax instruments, can influence location decisions and lead to a concentration of companies in countries or regions that do not have such strict environmental requirements. When it comes to regulations or taxes on CO₂ emissions, there can be doubly detrimental effects for the country that establishes the environmental regulations since it loses the economic activity generated by the companies without being able to avoid the harmful environmental effects.

There are several examples of measures to mitigate the effects on the competitiveness of companies while avoiding the incentive to relocate industries. One alternative is to promote international coordination of environmental policies on pollutants with global effects. An example of large-scale international coordination of environmental policies is the establishment of a CO₂ emissions reduction target for the countries of the European Union, acting together with the countries of Annex I of the Kyoto Protocol. However, international policy coordination is an extremely complex task.

Another possibility is to use the proceeds from green taxes to finance activities that stimulate the competitiveness of the companies concerned. In order to avoid nullifying the incentive generated by the environmental tax, it is necessary that the modalities of collection and reimbursement clearly differ. This type of mechanism is objectionable to the extent that the production costs of polluting industries are at least partially subsidized.

Another option is to offer extended tax exemption periods to companies with high carbon emissions so they can make the necessary adjustments. This, of course, postpones compliance with mitigation targets, but it favors the political economy of implementing an ETR. Reducing or exempting energy taxes in energy-intensive industries generates a kind of subsidy from energy consumers to companies, which reduces the incentive for them to develop innovations and energy-saving and efficiency practices. Despite these limitations, this form of intervention has been the most widely used so far to mitigate the effects of environmental taxes on competitiveness.

Finally, a suitable practice is to gradually introduce green taxes that can have an effect on competitiveness, applying increasing rates over a reasonable period of time and thus facilitating the adjustment process of companies' cost structures. Gradualness can contribute to generating incentives to implement mitigation actions, both through investment in more environmentally efficient equipment and in research and development activities aimed at creating technologies that meet environmental protection standards.

VI.4. OVERCOMING INSTITUTIONAL AND ORGANIZATIONAL OBSTACLES

The design and implementation of a strategy aimed at incorporating environmental taxes into tax systems require the active participation of the different levels of government. The involvement of national authorities and local administrations is essential to ensure the efficacy of the policies applied and to increase their effectiveness. The introduction of taxes on industrial pollutant emissions requires, for example, the integration of the authorities responsible for different levels of government since local pollutant impacts can be more adequately mitigated through the combined use of national and local corrective taxes (ECLAC, 2014).

The development of a successful environmental policy requires delimiting the attributions of the different levels of government with regard to the use of policy instruments and ensuring the necessary coordination between the actions of these levels. According to Gago and Labandeira (2010), the distribution of attributions in the management of environmental policy should be based on the fact that each instrument should be administered by the government agency in which most of the environmental costs and benefits associated with the economic activity under consideration materialize. The criteria for delimiting responsibilities should serve to guide the application of instruments even in supranational contexts in which various national states use the available policy instruments to achieve certain objectives, as is the case, for example, of the mitigation and adaptation actions required by climate change.

The adoption of a fully decentralized policy of environmental regulations could promote less effective practices in environmental terms. It is indeed necessary to ensure the predominance of a national perspective on environmental protection policy. Otherwise, competition between local jurisdictions may generate distortions in the allocation of investments and reduce the expected positive spillover of these investments to the local environment in terms of employment generation, access to services, and economic

growth. It could, moreover, generate what is known as a race to the bottom where different regions compete to offer laxer regulations and tax conditions.

Aligning taxes with other environmental policy instruments is one of the most important issues to consider when analyzing present and future environmental regulations (Gago and Labandeira, 2010). The proliferation of environmental instruments, surely motivated by the challenges of climate change, has become a reality that should cause concern. The overlapping of environmental standards, taxes, incentives for the protection of environmental assets, incentives to promote the sustainable use of renewable natural resources, voluntary national agreements to reduce greenhouse gas emissions and the development of markets in which carbon rights are traded, among others, are beginning to pose difficulties for the management of environmental policy. In principle, one might think following the precept that "the more, the better" and that the sum of instruments is a positive thing. However, in addition to the multiplication of administrative costs, the variety of interactions between the available instruments can be costly and even generate, for example, double taxation phenomena, with the subsequent loss of effectiveness of environmental policy.

The use of fiscal instruments for environmental care should be studied in the most general context. The maxim "an instrument for each objective" should be borne in mind. This does not imply that environmental taxation cannot play a complementary role with other instruments. On the contrary, as Falconer and Hodge (2001) argue, environmental problems should not be addressed in isolation but should be considered simultaneously with other development objectives. The adoption of a multidimensional approach is essential when formulating and evaluating environmental policies. This type of approach should be used to define and design the various instruments that contribute to their implementation.

VI.5. LATIN AMERICAN SPECIFICITIES

The design of an environmental fiscal policy in Latin America implies considering certain regional particularities and characteristics, which condition the feasibility and the features that the implementation process should embrace so that the benchmark initiatives can be effectively implemented. The way in which the differentiating factors of the region have an impact with respect to the experiences in developed countries must also be defined by considering the specific aspects of the economic, social and institutional structures of the different national economies.

First, Latin American countries are among the most unequal in terms of income and wealth distribution. Distributive inequality is expressed in multiple ways that affect the possibilities of human development, encompassing both personal and regional inequalities. In the Latin American context, the consideration of distributive dimensions becomes a key element for the viability of an ETR insofar as the available evidence shows that the lowest income groups and poorest regions in Latin America are more vulnerable to climate change and natural disasters than the higher income strata of the population (Galindo and Lorenzo, 2021).

Second, the region's current tax systems are characterized by their regressive nature and high dependence on the collection of indirect taxes, such as value-added tax (VAT), and taxes or royalties from productive activities intensive in natural resources (renewable or non-renewable). The limited importance of direct taxes in general and income taxes, are a distinctive feature of the tax systems prevailing in the region. Environmental tax reforms thus face particular challenges insofar as the economic effects of the new tax tools depend on interactions with the rest of the tax system.

Third, it is important to consider that Latin American economies strongly participate in international commodity markets, particularly for food and agricultural products, so that the threats of climate change have direct implications on the forms of production in the primary base. The technologies used by agricultural and livestock producers become particular key aspects of environmental fiscal reforms. These realities turn climate change mitigation and adaptation challenges into a strategic issue in the region's countries, influencing the characteristics of environmental fiscal instruments and determining the fiscal space available.

Fourth, the institutional framework in many of the region's countries is weak, and the actions of the state tend to provide insufficient or low-quality basic public goods. In relation to the existing deficiencies in public intervention for environmental purposes, it is worth noting the existence of a large number of resources applied to subsidize the consumption of energy products, mainly fossil fuels. These subsidies, which have existed for decades in several of the region's countries and which tend to be more important in economies with significant oil and natural gas reserves, have expanded considerably. In recent years, these tax instruments have intensified in order to compensate for international energy increases resulting from the war between Russia and Ukraine. The use of energy consumption subsidies to attenuate inflationary pressures caused by supply shocks resulting from the increase in international fuel prices, in addition to generating effects contrary to those originally intended, tends to go against environmental objectives, favoring the excessive consumption of highly polluting fuel goods and services.

Finally, it is important to reiterate that the GHG emissions generated by Latin American countries represent a small proportion of global emissions and that the sectoral structure of pollutant emissions is different from that prevailing in other regions, with a clear predominance of activities intensive in natural resources and transportation. The characteristics of emissions in the region mean that the use of environmental taxation should focus on a specific set of production and consumption responsible for generating negative environmental externalities.

VII. ETR POLITICAL ECONOMY DIMENSIONS

Fiscal innovations, especially tax innovations, involve political decisions that are adopted in a context in which political actors and various interest groups in society mobilize and make their positions on the proposed changes heard. This means that the incorporation of tax instruments has varied and complex political economy dimensions.

Available evidence indicates that tax reforms, whether partial or aimed at modifying the tax system as a whole, must face reactions from sectors that feel that their interests are being affected. There are few experiences in which tax innovations are passively accepted by those actors who will have to bear the weight of the new tax burden.

Taxpayers who will be forced to pay the new taxes tend to organize themselves and mobilize to block the implementation of reform initiatives. On the other hand, it is widely recognized in political economy literature that the sectors of society that would benefit from tax changes do not organize to support the proposed changes. There is also a large group of actors, often in the majority, who do not perceive the benefits that could be derived from the proposed innovations and who, therefore, assume a passive or indifferent attitude

towards the initiatives for change. The indifference of these sectors may even jeopardize the approval and implementation of the proposed innovations.

When fiscal reforms are motivated by environmental preservation, the political economy acquires characteristics that make them different from other reform modalities. The correction of harmful effects caused by negative externalities and the objective of ensuring the preservation and/or a sustainable exploitation of natural resources usually attract the attention of sectors that are more organized and more active than those that usually mobilize to prevent the implementation of tax innovations. These are, therefore, initiatives in which it is possible to observe the participation of sectors interested in the implementation of reforms.

On the other hand, it should not be forgotten that both domestic and foreign actors are usually analyzed and discussed environmental fiscal reforms. A country's environmental organizations and movements usually receive support and advice from international organizations. These organizations provide expertise and, in certain circumstances, technical and financial resources to strengthen the actions of locally mobilized organizations. The activity of non-governmental organizations (NGOs) dedicated to the defense of natural resources should be considered a unique and specific characteristic of the political economy of environmental fiscal reforms. On the other hand, this type of reform usually directly affects companies or large-scale productive projects. Opposition to environmental fiscal innovations sometimes involves powerful business actors that can influence political decisions, specifically parliamentary decisions.

Environmental issues, especially those related to climate change, are of growing interest to governments, international and regional multilateral organizations. Concern for ensuring the responsible and sustainable use of natural resources has become an important aspect of the actions of multilateral lending agencies that operate in the region. The activities of the Inter-American Development Bank (IDB), the South American Development Bank (CAF) and the World Bank have incorporated criteria related to environmental impact when granting loans to governments or companies seeking to finance projects in the region's countries. For some time now, environmental considerations have become part of the access protocols in the markets of the main industrialized countries (the United States, the European Union and Japan) for many of the region's exportable products.

The influence of political factors can condition the reform process in various ways. The ideological perspectives and programmatic positions of political parties, the characteristics of government coalitions, the interaction between the executive and legislative branches, economic circumstances, and the political-electoral cycle all influence the chances that reform proposals can be implemented. These factors will determine the interests and motivations of governments and political actors, establishing the framework in which discussions and negotiations will take place at the time of approval and implementation of a reform.

The ideological positions of the political parties that hold government responsibilities in a given country may determine the predisposition to promote fiscal transformations. Fiscal policy, in general, and tax policy, in particular, are areas where ideological differences between political actors are expressed. Discrepancies become apparent in preferences for certain tax modalities. Efficiency and equity considerations weigh differently depending on the positions of the political actors. Schematically, it can be stated that parties on the left of the ideological spectrum tend to be more interested in the distributive effects of taxation and, therefore, prefer progressive tax modalities in terms of income and wealth distribution. Left-wing parties tend to be more inclined to state intervention in the allocation of resources and, therefore, should be predisposed to promote tax reforms based on environmental motivations. Therefore, it seems to be an interesting option

to link environmental fiscal measures with a progressive coalition for a better income distribution. On the other hand, political parties on the right tend to give greater priority to considerations of efficiency and prefer neutral taxes in terms of their effects on resource allocation. The static and dynamic effects on efficiency caused by externalities affecting the environment have traditionally been considered one of the main arguments in favor of using environmental fiscal instruments.

Environmental tax reforms involve both efficiency and equity considerations. Therefore, it could be conjectured that the ideological perspectives and positions of the different political parties should not become obstacles to promoting tax innovations based on environmental motivations. The existence of sectors in society organized and mobilized in defense of environmental preservation, on the other hand, is a factor that influences the behavior of governments and political parties. It should be noted, however, that in many countries, environmental organizations and movements are more likely to be heard by left-wing parties. The reality in Latin America shows that the difficulties in implementing environmental fiscal reforms involve administrations headed by both left-wing and right-wing parties. In practice, it is notoriously difficult to implement fiscal reforms in the region, whether or not they consider environmental considerations.

The existence of parliamentary majorities of the governing parties may have important implications when determining the willingness of governments to promote tax reforms and, above all when analyzing the characteristics and scope of the proposed changes. The fragility of governing coalitions and the lack of solid programmatic agreements between the parties and political sectors participating in a government can be determining factors in the viability of reform efforts. When a government does not have a parliamentary majority, the negotiation on a tax reform can become a very tiring exercise. The lack of majorities in the Legislative Branch is a political factor of singular importance in explaining the low predisposition for promoting changes in the tax structure.¹

The parliamentary treatment of a tax reform is a propitious field for the different pressure groups to act and express themselves. Business chambers, trade unions and civil society organizations find in the parliamentary process of initiatives the appropriate terrain for political leaders of all parties to listen to their arguments and to make their position on reform initiatives known. The level of formality and transparency with which the different pressure groups act is an aspect that gives specific characteristics to the political economy of tax reforms.

The timing of the electoral cycle when tax reforms are presented and discussed is also an important factor in terms of political economy. There is a consensus that there are adequate conditions to carry out reform initiatives during the first part of the government's term of office, especially when contemplating the creation of new taxes or an increase in the tax burden. The truth is that it is difficult for the best opportunities for approving tax reforms to be found during the last year of government, especially if they are intended to introduce significant changes in the tax structure.

Experience in many Latin American countries shows that, due to fiscal or financial difficulties, tax systems changes usually occur during macroeconomic adjustment periods. When a fiscal adjustment is being processed, the rates of existing taxes are usually increased, or new taxes are created. The logic of government action in these circumstances is guided by the urgent need to balance public finances and

¹ De Souza (2013) argues that legislators support reforms not only because of their economic convenience in terms of the welfare of society but especially when they take the transformations' political viability and sustainability over time into account.

ensure the restoration of fiscal sustainability. The previous section mentioned precisely that, in crisis circumstances, particularly when fiscal sustainability is threatened, governments assume the "cost" of changing tax structures. However, it should be pointed out that in this type of situation, sophisticated arguments about the effects of new taxes on equity and efficiency are unlikely to prevail. In moments of crisis, the need to improve the fiscal result dominates over any other line of motivation.²

Demographic characteristics also influence political decisions and the predisposition of governments to introduce fiscal innovations. The population's age structure has political implications that are manifested, for example, in the electoral weight of different groups in society. The predominance of older or younger people in the population can become an important factor in making tax decisions.

Economic and social elites can play an important role in the political economy of tax reforms. There are many examples of the ability of elites to minimize their contribution to the tax burden or to implement tax avoidance strategies (Sokoloff and Zolt, 2006). The blockage of recent reform initiatives, which sought to strengthen the relative share of direct personal income taxes in some countries in the region, is just one example of these actors' political weight and influence. These realities are amplified in some cases by the integration of business leaders into governments. Some authors such as De Souza (2013) argue that this practice has put a brake on the adoption of more progressive fiscal policies and has contributed to strengthening the position of economic and business elites to maintain privileges that are expressed in tax structures. Strengthening this line of reasoning about the ability of economic elites to block reforms is Rius (2013a, 2013b). This author considers that the limited integration of the economic and business elites in the Uruguayan government was one of the reasons that helps to explain why it was possible to approve and implement a tax reform that was so comprehensive and progressive in 2006.

It is evident that political actors' degree of autonomy with respect to the elites -and corporate interests in general- is an essential element needed to ensure that particular interests do not impede the implementation of fiscal reforms that imply global improvements from the point of view of efficiency and equity. The reductionist perspective that argues that the behavior of policymakers can be represented by the same criteria and motivations with which economic agents act is far from what has been observed in the reality of many countries (Schroeder, 2010). Politicians' specific personal interests are an important force influencing their behavior and their willingness to promote certain reforms or initiatives. The reality indicates that policymakers have convictions and are guided by them.

VIII. TAX REFORMS' FEASIBILITY

The incorporation of environmental objectives in tax systems must consider the features of the tax structures that are in place in each country. The characteristics of tax systems, as well as the capacities of tax administrations, can condition the intervention modalities that need to be applied in a given country. Lorenzo (2014) argued that considering the restrictions imposed by the characteristics of these systems, there are at

² The adjustment of fiscal policy has become a basic requirement for accessing sources of financing from the International Monetary Fund (IMF) and other multilateral lending agencies such as the World Bank and the IDB.

least two dimensions that must be considered when including environmental objectives in the fiscal policies of each country.

The first is related to the degree of particularities of the instruments. Two clearly differentiable modalities can be identified. On the one hand, environmental objectives can be incorporated from instruments specially designed to fulfill these purposes. In this case, the interventions are included in the tax structure to address the effects of a certain externality, establishing a close link between environmental objectives and the tax instrument applied. On the other hand, it is possible that environmental considerations are only part of the criteria used to determine the fundamental pillars of tax structures. In these circumstances, the direct link between the instruments used and the objectives and motivations for environmental preservation is lost. The second dimension is particularly linked to political economy. The literature on tax reforms and the available empirical evidence show that reform initiatives must face actions and reactions that may condition the viability of the proposed changes.

The incorporation of environmental motivations in fiscal reforms in Latin America has at least two aspects that are particularly important from the perspective of political economy.

First of all, it should be noted that there is considerably less political and social commitment to environmental issues in Latin American countries than in most developed countries. It is undeniable that the reality has evolved over time and that there is now greater awareness of the importance of environmental preservation in the region than in the past. However, there is still a widespread belief in Latin America that interest in these issues is a sort of "imported concern" and that, when it comes to setting priorities, from a political point of view, other objectives should be considered first.

Second, it is important that the drivers of reform initiatives make efforts to inform and disseminate the rationale and motivations for fiscal innovations. This is especially relevant in the case of interventions that pursue environmental objectives. The preparation of an information and communication strategy that explains the rationale behind the proposed changes should be considered a priority that can significantly contribute to the feasibility of the proposed changes. Providing technically sound information on the effects of externalities with a negative environment impact can play an important role in influencing public opinion. In fact, the information and communication strategy can become a crucial factor in mitigating the impact of the reactions and arguments of agents opposed to reform initiatives.

VIII.1. POLITICAL ECONOMY OF "PIGOUVIAN" INTERVENTIONS

The theoretical and conceptual framework proposed by Pigou (1938) on corrective taxes can be considered the traditional approach used in the design of fiscal policy interventions that pursue environmental purposes. According to the "Pigouvian" approach, the design of each intervention must be based on the identification of the effects of a given externality. The objective of fiscal policy is to make those responsible for generating an externality change their behavior or take responsibility for the adverse effects of their actions on society as a whole. Interventions inspired by this argument, therefore, take the form of "payment for damage" or "payment to avoid damage". The use of this type of instrument is based on the need to restore the agreement between the criteria of social and private profitability. Fiscal policy is used in this context to reestablish the compatibility between the interests of individuals and the general interest, in circumstances in which the effect of the externality has altered the concordance between both criteria.

In the case of behaviors that generate environmental pollution, the criteria on which the "Pigouvian" approach is based lead to the application of taxes or subsidies on the activities that generated the externalities. These intervention modalities are examples of specific taxes or penalties and fines applied on behaviors or activities responsible for environmental deterioration. In the case of a positive externality, it is a matter of implementing adequate incentives for agents to adopt behaviors tending to ensure the preservation of a certain environmental asset that could be compromised by the agents' actions based on their personal interests. The implementation of subsidies or the establishment of so-called payments for environmental services are classic examples of fiscal instruments designed on this approach.

As pointed out in Lorenzo (2014), the application of the "Pigouvian" logic implies that each intervention must be designed to compensate for the effects of the externality. There is, therefore, a strong link between the fiscal instrument and environmental motivations. The application of this criterion implies that interventions cannot generate resources for public finances over and above those required to ensure the preservation of the environmental asset. In the case of a specific environmental tax, it would not be appropriate to use it to collect an amount greater than that necessary to compensate for the effects of the externality. At the most, the maximum effectiveness of an intervention inspired by the "Pigouvian" approach would consist of inducing changes in the behaviors that give rise to the externality.

The political economy of interventions inspired by the "Pigouvian" argument is necessarily instrument-specific. In a certain sense, this kind of tax innovation can be considered to present a classical political economy involving, on the one hand, the governments that promote the reform initiatives based on the general interest of society and motivated by the correction of the effects of an externality, and on the other hand, the individuals responsible for the generation of the externalities and who will have to bear the new tax burden and therefore have an "understandable" motivation to oppose the reform initiative. The opposition may take the form of a rejection of the very existence of environmental damage or be expressed in the form of a questioning of the estimation of the damage carried out by the promoters of the initiative.

Depending on the economic and social importance of the environmental damage and the interest that the issue awakens in the rest of the citizens, the activism of environmental organizations and the mobilization of sectors of society affected by environmental damage may turn out to be important factors. The viability of the tax innovation will ultimately depend on the level of government commitment to the initiative, the management of public opinion and the actions of interest groups seeking to influence parliamentary decisions.

From the point of view of the political economy, government actions aimed at correcting externalities that cause concrete and quantifiable damage to the environment allow the development of an argument that is easily understood by the public. An agent that generates a negative externality and causes damage to an environmental asset is, in principle, in a relatively "weak" position from a political point of view. As these issues become increasingly important in forming public opinion, aggression towards the environment generates social condemnation. In this context, it is essential for the authorities and those affected to be able to provide evidence of the harmful effects on the environment.

The information and communication strategy must be based on technical foundations and reliable studies. Deficiencies in this area can conspire against the viability of the proposals. The quantification of the effects of the externality must be based on procedures and methodologies that minimize controversy about the damage caused. To this end, the authorities must guarantee the seriousness and scientific quality of the studies. This can be done by hiring experts with recognized knowledge and background in the field.

Depending on the importance of the subject under consideration, the possibility of having several independent evaluations could even be considered. In certain cases, the very complexity of the assessments and the lack of accredited experience among local professionals mean that international experts must carry out the assessments. The authorities must ensure that the methodologies used in the technical studies, as well as the quality and prestige of those responsible for the assessments, contribute to the reliability of the assessment process. In short, technical studies and evaluations play a fundamental role in the design of "Pigouvian" fiscal instruments.³

A public presentation of technical studies and a consultation with civil society can contribute to transparency and give greater legitimacy to government proposals. It is important that the promoters of the initiatives convene the consultation forums and that they involve a wide range of participants. The results of these gatherings often play an important role during parliamentary discussions.

VIII.2. POLITICAL ECONOMY OF COMPREHENSIVE REFORMS

One alternative for incorporating environmental objectives is to consider these objectives as a fundamental pillar of the tax system. This involves considering motivations related to the preservation of environmental assets when defining the main characteristics of tax systems and tax incentive schemes. In this case, environmental issues are considered when defining the tax bases and the applicable rates on each of the taxes that are part of the system. The discernment of applicable rates on different productions and certain consumptions, as well as the use of exemption schemes - including income tax deduction schemes - become useful tools to include these goals in tax systems.

Such an approach is particularly relevant in circumstances where the authorities intend to comprehensively reform the tax system.⁴ In cases where the authorities intend to move forward with a wide-ranging reform, environmental considerations will have to interact with the rest of the goals and principles that order and give foundation to tax structures, namely efficiency, equity, sufficiency and administrative simplicity. The definition of the structure of the tax system will emerge from the joint and balanced interaction between the different objectives. This implies that environmental motivations will, in many cases, be incorporated into the structure of taxes that may have been designed to fulfill other functions as well. This places the discussion on environmental fiscal policy at the center of the country's fiscal strategy debate.

One aspect to consider from the point of view of the political economy of tax reforms is related to the intention of taking advantage of the reform process to increase the total tax burden on taxpayers.⁵ This alternative highlights the discussion on the sufficiency of resources. Considering the political and economic implications of increasing the tax burden is particularly relevant in Latin America since the arguments used to promote tax reforms in many countries appeal to the need to strengthen social spending and improve the

³ This is especially relevant when interventions are aimed at ensuring biodiversity or the sustainable use of renewable natural resources used, for example, in agricultural production.

⁴ This does not imply ruling out the alternative of incorporating environmental motivations as a criterion for improving a given tax, as may be the case with the reform of energy subsidies.

⁵ It should be noted that some of the regions' countries have tax burdens that barely exceed 10 percentage points of GDP.

volume of resources applied to the production of public goods and services used by the most vulnerable social sectors of the population.

When governments explicitly propose to increase the tax burden, the political economy analysis must necessarily include considerations related to the destination of the additional resources. The importance of this issue was expressly underscored when analyzing the recurrent difficulties faced by the governments of some countries in eliminating energy subsidies. This can be considered as an example that illustrates the role played by decisions regarding the areas of public spending in which the resources generated by the reforms will be applied. In a region where tax systems have regressive biases, it is likely that government commitment to use the new resources to strengthen projects and programs that reduce inequality and improve distributive equity can help broaden the base of political support for reform initiatives. There are, however, examples, such as the recent attempts to reform fuel subsidies in Mexico, which show that the commitment to apply additional resources in areas with high distributional impact does not ensure the political viability of reforms.

The incorporation of environmental motivations into a revenue-neutral tax reform raises specific issues from a political economy perspective. The fundamental question to consider is the political priority of environmental issues over other motivations. In most Latin American countries, it seems difficult for the protection of environmental assets to prevail over objectives related to the efficiency and, above all, the equity of the tax system. The way in which environmental objectives can play a significant role in defining the content of the reform is precisely related to the interaction of these motivations with improvements in efficiency and equity. In this case, environmental considerations should be used, from a political point of view, to reinforce arguments related to income distribution and resource allocation. The elimination of energy subsidies, combined with a reduction of other indirect taxes with regressive effects, could be an example of a tax reform that would contribute to efficiency improvements, to a more equitable distribution and that would have beneficial effects on the environment.

A wide-ranging tax reform is one of the initiatives that requires the greatest efforts from its promoters. The government's commitment to the implementation of the reform proposal becomes, in this case, one of the keys to the viability of the initiative. Political leadership and citizens' comprehensive assessment of the government's performance are usually at stake in moments like this. The importance of success in the implementation of the reform means that there is a need for particular requirements and conditions for governments to decide to embark on this type of undertaking.

The management of the political economy of a tax reform should also pay attention to the process of drafting the initiative. The early dissemination of the reform's objectives and its main general guidelines, together with the holding of public consultations, helps to ensure that the different interest groups and the general public are aware of the content of the reform and can be informed. This helps to ensure that the different interest groups and the general public are aware of the content of the reform and can express their arguments and points of view before the government completes the process of drafting the bill that will be sent to Parliament.

VIII.3. THE RISKS OF CLIMATE CHANGE FOR THE ETR AND THE GENDER STRATEGY

Climate change poses serious risks for an ETR. The current inertial scenario shows signs that it is not sustainable by 2050, given the magnitude of the public deficit and public debt it causes. There are also physical risks arising from the negative impacts of climate change. The increase in temperature and the presence of various extreme weather events, for example, result in an increase in the fiscal deficit, mainly due to a reduction in tax revenues.

Likewise, the climate transition to a natural carbon economy generates several risks for fiscal policy. The construction of a set of stranded assets associated mainly with oil and gas production, for example, has the collateral effect of reducing tax revenues. New fiscal resources must compensate for this reduction. In addition, the climate transition requires significant investments in infrastructure. Available evidence suggests that it is necessary to maintain around 5% of investment in infrastructure until 2030 and probably between 2% and 5% of GDP to meet the main social demands. This implies a substantial increase in public spending that will have to be financed so that it does not increase the public deficit. Thus, the climate transition in Latin America implies an increase in public spending that requires the generation of additional fiscal resources in order not to create a larger public deficit.

A just climate transition also requires addressing gender inequality and deep intra-generational inequalities. It is common for young people and adults to earn more than they spend and thus contribute part of their resources to support the infant and older generations. Conversely, older adults and infants spend more than they earn. This structure of intra-generational transfers includes a significant part of private transfers in Latin America, while in other countries, it is common for these transfers to have a high public component. Thus, childcare systems allow for the consolidation of intra-generational public transfers with long-term effects on income distribution.

This leads to the construction of an intelligent fiscal policy that, while encouraging economic dynamism, contributes to the well-being of infants and promotes gender equality. The construction of a childcare system generates several positive effects. First, a care system creates direct positive effects on the well-being of infants and, in addition, increases their productivity and, therefore, their income in the long term. Second, care systems reduce women's time poverty, since they are still in charge of care non remunerated work across all the region. In this way, a care system allows women to participate in the formal market under better conditions, which contributes to closing the gender gaps in participation and wages in the formal labor market. Third, the construction of a care system generates a higher level of effective demand, creates jobs and regularizes existing informal work, and increases tax revenue, all contributing to greater economic dynamism.

The construction of care systems requires an increase in public spending that can be financed in the long term. Therefore, this care system must be framed within the construction of a new fiscal strategy.

In Latin America, climate change and gender equality challenges induce additional risks to fiscal and public debt policy. These risks generate additional fiscal pressures basically through reductions in tax revenues or through an increase in public spending.

IX. ENERGY SUBSIDIES

In a regional context in which tax systems are fundamentally based on indirect taxes and where the share of value-added tax can represent more than 50% of total state revenues, the role of policies to subsidize the consumption of energy products stands out. Because of the volume of resources involved and the implications they have for the environment, these policies are of great significance. The reform capacity of these policies is also particularly rich and complex in terms of political economy, which is why the analysis of these policies deserves specific attention in the framework of this paper.

In several of the region's countries, the prices of fossil fuels are heavily subsidized and usually receive tax treatments similar to those of other goods and services. In several countries retail prices of oil and gas fuels lie considerably below international reference prices. This reality can be considered an anomaly in price formation. These policies have, however, important distributive effects and entail a distortion that affects the efficient allocation of the economy's resources.

Energy subsidies obviously stimulate energy consumption. This has important consequences for the use of private transportation by generating problems of congestion, pollution, traffic accidents, and accelerated deterioration of roads and transportation infrastructure. There is also evidence that subsidized fuel prices encourage smuggling activities to neighboring countries and that these illegal activities can cause worsening insecurity problems.

An ever-increasing vehicle fleet has an impact on the increase in the number of transport-related accidents, causing loss of human lives, additional costs for health systems and higher insurance premiums. Practically all of Latin America's major cities suffer from transport congestion problems, which have repercussions on productivity and the population's well-being. The situation becomes even more worrisome when considering that in many of the region's countries, only a minority of the population owns and uses motor vehicles on a regular basis. It was estimated that in Venezuela in 2005, the richest 5% of the population received almost 90% of the fuel subsidies used by private cars (IMF, 2013b).

From a social point of view, these intervention modalities are highly regressive and accentuate the pre-existing inequality in the region's countries. In some cases, as in Ecuador and Venezuela, the annual value of subsidies on these products represents more than 5 percentage points of GDP. To get a real idea of the importance of these policies in the context of the countries' taxation, it can be noted that the transfers received by the private sector represent a higher figure than the public budgets dedicated to health or education (Barrios and Morales, 2012; Commander, 2012).

The level of subsidies on the prices of these products has an impact on household consumption and on the use of energy inputs by companies. Evidently, these policies represent an incentive for households to consume more energy and for companies to use more energy-intensive technologies to produce goods and services. This "over-consumption" of energy products has undeniable environmental consequences, insofar as part of the greenhouse gas emissions and environmental pollution in Latin America's main cities is linked to the consumption of energy produced from fossil fuels.⁶ The intensity of energy consumption has become

⁶ The region as a whole is of little global importance in terms of greenhouse gas emissions. However, there is great heterogeneity in the volumes of emissions made by the different countries, as well as in their sectoral origin (WRI, 2010). Despite their low share of global emissions, Latin American countries are increasingly vulnerable to the

the real and potential factor that generates the greatest environmental problems in some countries of the region.

It is evident that the revision of subsidy policies for the consumption of energy products would have important economic and social repercussions. At the same time, it could contribute to tackling some of the region's environmental problems. Given the magnitude of the resources involved in sustaining these policies and considering the number of actors that could be affected by their modification, it can be assumed that reforming these intervention modalities will not be a simple task from a political point of view. If progress is to be made in this direction, it is necessary to understand the economic effects and the particular interests affected by reform initiatives.

The information available and various studies carried out in recent years suggest that the reform of subsidy policies would lead to improvements in the level of welfare of society as a whole, in many cases generating progressive distributive effects and eliminating costly and inefficient distortions in the allocation of resources. However, implementing reform initiatives could face difficulties and reactions that could call their implementation into question. This is one of the areas of public policy in which the political economy can manifest itself with the greatest intensity.

The main difficulty that the reform of these policies could face is related to the diversity of economic and social actors that could be affected and to the difficulty that the promoters of the reforms could encounter in explaining the benefits of the initiative for society as a whole.

Among the actors that would be harmed are the higher-income sectors of society. This is generally a minority belonging to the upper deciles of the income distribution, which concentrates a relevant part of the economic power and usually influences politicians and rulers. With data corresponding to 2005, Barrios and Morales (2012) estimated that the richest 5% of the Venezuelan population appropriated 25% of the total subsidies implicit in the prices of oil-derived fuels, while the poorest 25% received benefits that did not even represent 5% of the same. In Mexico, it was estimated that in 2008, fuel subsidies received by the richest decile of the population represented more than double the total amount of subsidies received by the poorest decile. This amount includes subsidies corresponding to food support programs, the so-called popular insurance, all energy subsidies and the rest of the programs that establish direct benefits for the lowest-income sectors (Hernández, 2012). In both cases, it is clear that a small minority of the population is taking advantage of a majority portion of the benefits. At the same time, the state loses an important source of tax revenues that could be used to strengthen policies with a high distributive impact.

The poorest and most vulnerable sectors of society could benefit from the revision of these policies, although it is likely that among them the idea prevails that the increase in the price of energy would cause them as consumers direct harm and that other actions will not offset this effect. The adverse reaction of these sectors would be based, in part, on the increase in fuel prices and, in part, on the uncertainty and distrust regarding the use that would be made of the increased fiscal resources resulting from the reform and the potential second-round effects of the increase in gasoline prices on, for example, public transportation fares or food

consequences of climate change. Recent studies by ECLAC and the IDB (ECLAC, 2009; 2010; IDB-ECLAC-WWF, 2013) have provided data that raise warnings about the consequences of climate change on the economic and social reality in some countries.

prices. The promise of applying these fiscal resources to programs with a strong progressive impact in terms of income distribution may not be believed. The promoters of the initiatives should expressly contemplate the reduction of uncertainty about the final effects of the policy. The viability of the reform depends to a large extent on the capacity of the authorities to design reform proposals that ensure improvements for society as a whole and that make the specific benefits perceived by the majority sectors of the population perceptible. There are examples of governments that have used the resources generated by energy reforms for socially valued programs. Studies conducted by the IMF (2013a, 2013b) specifically mention the cases of Jordan, Indonesia and Ghana as successful examples in this area.

For this type of reform to gain political viability, the authorities must deploy an information and education campaign for the population in which the content of the reform strategy and how the funds it generates will be used, are clearly explained. Confidence must be generated among the majority sectors of society. To this end, it is essential that governments can credibly commit themselves to the reform initiative and demonstrate their willingness to comply with the commitments undertaken.

Some authors argue that energy reform proposals are more likely to be successfully implemented if resources are reserved to be specifically applied in certain areas, especially in programs with a strong distributive impact (Barrios and Morales, 2012). Despite the rigidity implied by this commitment of prior allocation of budgetary resources to a certain type of expenditure, it is important to assess this commitment's role in generating trust and support from the population.

Among the various redistributive consequences of subsidy programs in the energy sectors, those related to the effects on transportation services and cost increases that generate a loss of competitiveness in manufacturing and agricultural activities are particularly significant. These subsidies also have impacts that make up a complex political economy. For example, part of the regressive distributive effects caused by subsidy policies for energy products is related to the collateral effects on private transportation, where the main beneficiaries of these subsidies are middle- and high-income groups. This occurs despite the fact that energy subsidies also have a positive impact on the prices of public transportation services used by the poorest sectors of the population. Thus, most of the subsidies are destined for middle and high-income groups, but the low-income groups that receive a smaller proportional share wish to preserve.

The price of public transportation is generally a politically sensitive issue. There are many examples of countries in the region, some of them quite recent, in which the increase in the price of urban public transportation provoked popular reactions and demonstrations with strong political impact and great significance in terms of the popularity of governments.

These realities make it evident that from the design stages of the reform strategy, alternatives should be considered to mitigate the impact on the sectors that preferentially use public transportation services. One alternative is to generate a "subsidized ticket" system that can be used exclusively by the lower-income population, retirees, pensioners, and students who use transportation services to attend schools and high schools.⁷ These types of subsidies can avoid some of the possible regressive effects of the reform and could contribute to less opposition to the implementation of the new policy.

⁷ The creation of a subsidized ticketing system for public transportation generates arbitrage possibilities between the different pricing modalities. This must be considered when designing the subsidy scheme if deviations and operational distortions in the operation of the system are to be avoided (Barrios and Morales, 2012).

It should also be noted that the transportation sectors in general, and those specializing in freight transportation in particular, represent a powerful and well-organized group in many countries. Higher fuel prices and the subsequent loss of competitiveness that will occur in these services could become a significant source for opposition. In addition to directly impacting transportation activities, the increase in fuel prices may have additional effects that are relayed throughout the logistics chain, and then the reform result in impacting consumer prices (IMF, 2013a).

Companies in the agricultural sector could also be affected by the revision of the subsidy policy. An important part of the machinery used in these activities, especially in agriculture, runs on fuel and electricity so that the elimination of subsidies could increase production costs, with the subsequent loss of competitiveness (Sterner, 1989). The machinery used in these activities consumes *diesel*, and an alternative, eliminating only the subsidies for gasoline and naphtha consumption, could be conceived to mitigate the impact on costs. However, this type of alternative should be handled with care since it could generate distortions and undesired substitution effects on the use of other energy sources. Moreover, the contribution of *diesel* to greenhouse gas emissions should not be ignored.

Maintaining subsidies for *diesel* may lose effectiveness if this fuel is used for purposes other than agricultural production. An example of the distortions that could be caused by the application of this type of alternative can be found in the Uruguayan experience in the early 1990s. In that period, the government implemented an initiative to reduce specific *diesel* consumption taxes to improve agricultural competitiveness. After a decade, the result of the application of the policy was the expansion of *diesel* consumption by private automobiles, generating an "excess consumption" of this petroleum derivative and an "excess supply" of other types of gasoline that ended up being sold abroad at subsidized prices.

Concerns about the effects that the elimination of energy subsidies would have on inflation, international competitiveness and energy price volatility deserve consideration when designing and implementing policy changes. In various technical reports, the International Monetary Fund (IMF) has argued that energy price increases could have an impact on inflation in the short term, though it argues that with a macroeconomic policy strategy, the policy change would not have lasting effects on inflation and would not necessarily impact wage setting (see, IMF, 2013a). In any case, it should be considered that when countries have high inflation levels, the implementation of these price, tax and subsidy reforms can be particularly risky for macroeconomic stability.

The effects of the elimination of energy subsidies on international competitiveness are undeniable, particularly in energy-intensive manufacturing activities. The change in policy could have effects especially in the short term and particularly in countries with high inflation. In Nigeria and Iran, measures were implemented to compensate for competitiveness losses in some industries and to mitigate the impact of higher energy prices (IMF, 2013b). However, it should be noted that the long-term effectiveness of such interventions is questionable. On the other hand, public support for sectors negatively affected by the increase in production costs may extend over time and generate a new subsidy scheme that ends up generating political economy problems as complex as those observed in energy consumption subsidy policies.

Oil-exporting countries have a fiscal structure that is highly dependent on revenues from these activities. Therefore, the high volatility of the international prices of these products directly impacts fiscal policy. The elimination of subsidies to oil derivatives thus becomes a key component of fiscal policy and acquires more relevant macroeconomic connotations than in other economies. That is, the elimination of subsidies may

occur in a macroeconomic context of loss of fiscal revenues from oil and gas exports and, therefore, in the presence of various macroeconomic imbalances.

From a social point of view, fluctuations in the price of energy products can have destabilizing effects. The way in which revenues from oil activities are managed could simplify the process of implementing policy change. Sovereign wealth funds in which resources generated by oil activity can be accumulated can be a factor in the viability of subsidy policy reforms (OECD, 2011).

The aspects considered above show that reforms of energy consumption subsidy policies can have positive effects from the point of view of the general welfare of the population, but also that reform initiatives could face a political economy logic that involves a richer and more diverse variety of actors than the one usually found when considering other fiscal and tax instruments.

When discussing energy subsidies in Latin America, the main countries to consider are Mexico, Venezuela, Bolivia and Ecuador.⁸ These countries have been applying energy subsidy policies for a long time. In all four cases, these policies have significant costs in terms of fiscal resources, but they are a fundamental component of the political and electoral support of the governments. In all of these countries, there have been attempts to concretize reforms, but in most cases, they failed. For example:

Since an agreement established at the end of the 1980s, the consumer price of gasoline in Mexico has been set based on criteria aimed at moderating fluctuations in international reference prices ("sliding policy"). When the international price is above the domestic price, gasoline will be subsidized; if it is below, there will be a tax. Since 2006 the international price has been systematically above the price set for sale to individuals and, therefore, gasoline consumption has benefited from a very significant subsidy (Hernández and Antón, 2014).

There have been several attempts to modify this policy. In 1999 the government proposed a comprehensive reform of the subsidy programs, which included a privatization component. The reform initiative failed due to a combination of factors. There were some legal problems, but the main opposition came from interest groups that brought all their influence into play to prevent the reform from being implemented. There were indeed failures in public communication. However, the factors that made the reform fail are directly related to the actions of economic sectors that were not interested in the elimination of subsidies.

In 2001 there was a second attempt at reform. This initiative placed less emphasis on aspects related to privatization, but the necessary consensus for parliamentary approval of the project was not reached. In 2002, a new system of electricity tariffs for the sectors with the highest consumption was achieved. However, later the so-called "summer subsidy" began to be applied, which ended up erasing the final impact of the reform attempt (IMF, 2013b). In 2008 there was a new attempt that also failed. Recently, a modest carbon consumption tax was introduced. An analysis of the characteristics of this tax can be found in Hernández and Antón (2014).

⁸ In Argentina, the application of subsidies on energy consumption has also been extended. The fiscal cost of these measures has been the subject of constant political debate during the last few years. The reduction of fuel consumption subsidies (gas and oil) has been a permanent issue in the negotiations of the financial assistance programs that the country maintains with the IMF.

In 2013 President Peña Nieto proposed a reform that would allow shared utility contracts between the public and private sectors in the energy sector, enabling private participation in petrochemical processes, but did not provide for the revision of the subsidy policy. The reform's website expressly clarifies that subsidies to families, industries and commerce will be guaranteed and that one of the main benefits of the new policy is to ensure that electricity and natural gas will remain cheap.

In 1989, Venezuela experienced a series of violent events and riots, known as the "Caracazo", as a consequence of the announcement of an unexpected gasoline price increase. There were three days of demonstrations that were strongly repressed by military and police forces. In Venezuela, cheap fuel is perceived as a right of all citizens. However, the benefits of this policy are basically appropriated by sectors of the economic elite and by a highly organized and very powerful transportation sector. The 1989 experience exposed the drastic political consequences that the correction of fuel subsidies can have, which explains why no new reformist initiatives have been presented these last few years.

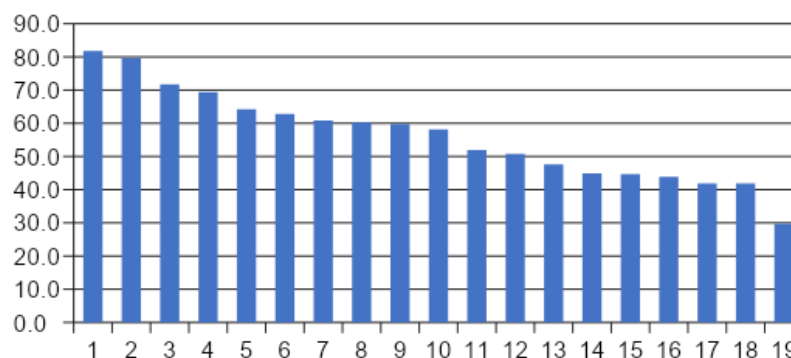
In 1998, the government of Ecuador attempted to raise the price of gas and diesel but quickly had to backtrack. The price increase was accompanied by a transfer program for women with dependent children, the elderly and the disabled. The program was quite successful and reached 50% of households. However, after a sharp depreciation of the exchange rate, there were major riots in July 1999, and the government was forced to reinstate fuel subsidies in September 1999. Since then, the government has managed with a mixed perspective. While there is an awareness that subsidies are regressive, there has been no expressed willingness to eliminate them altogether.

There have been other recent attempts to reform the fuel price structure that have also faced various obstacles. For example, an attempt to reduce subsidies in Mexico under President Peña Nieto had to be reversed.

X. CLIMATE AND SUSTAINABLE FINANCING IN LATIN AMERICA

Awareness of the importance of environmental and social sustainability issues is leading to a paradigm shift in global finance. Investors, and multilateral and bilateral financial institutions are increasingly prioritizing sustainability factors in their operations. They are paying increasing attention to assessing the impact of actions taken by governments and companies in their credit risk assessments and, more broadly, in defining their investment strategies. In fact, ESG (*Environment, Social and Governance*) factors are now being adopted as standards by investors, institutional financiers and even traditional financial intermediaries (banks and financial intermediaries in general). Investors now recognize these factors as indicators that add value to countries' economic and social development potential (Figure 16).

Figure 16.
ESG score for selected Latin American and Caribbean countries
(index and position in ranking among 63 countries)



Position in
Ranking

Source: JP Morgan.

X.1. OPERATIONS OF INTERNATIONAL FINANCIAL INSTITUTIONS

The Multilateral Development Banks (MDBs) and the International Club of Development Finance Institutions made a commitment at the One Planet Summit (2017) to a "joined-up approach" to help countries meet their Paris Agreement commitments. An essential part of this approach is congruence between multilateral financial support to address climate change on the one hand and multi-country strategies for climate resilience and deep decarbonization of the economy over the long term, on the other. As part of this joint approach, these institutions agreed in 2018 on a set of actions aimed at providing policy support, and aligning operations with mitigation goals and sustainable development trajectories. At the 2019 UN Climate Action Summit, multilateral banks announced the intention to aim for more ambitious environmental targets and embraced the need to strengthen the measurement of climate action results.

The evolution of funding by the Multilateral Development Banks (MDBs) to address the challenges of climate change in the region demonstrates the commitment of these institutions to the advancement of sustainable financing.

The MDBs provide most of the climate finance in the region's countries.⁹ Between 2010 and 2019 these institutions have, on average, financed 54% of total climate finance in the region. This reality contrasts with what happened in the early years of the 21st century, when bilateral agencies were the predominant source of climate change financing in the countries of the region. Table 4 shows that resources from MDBs have been growing systematically, accounting for 66% of the total in the 2017 - 19 triennium. According to the OECD database, of the more than USD 79 billion channeled to Latin American and Caribbean countries between 2010 and 2019, the MDBs have contributed more than USD 42 billion. Bilateral financing has remained relatively stable regarding the amounts provided, averaging USD 3.2 billion annually in the decade under review.

Table 4. Climate change credit approvals for Latin American and Caribbean countries 2010-2019 (in % and billions of USD).

| | <i>2010-12</i> | <i>2017-19</i> | <i>2010-19</i> | <i>Total Amount 2010-19</i> |
|---------------------------------|----------------|----------------|----------------|-------------------------------------|
| MDB | 38% | 66% | 54% | 42.664 |
| Bilateral Institutions | 59% | 28% | 41% | 32.336 |
| Other multilateral institutions | 4% | 6% | 5% | 4.095 |
| Private donors | 0% | 0% | 0% | 158 |
| | 100% | 100% | 100% | 79.253 |

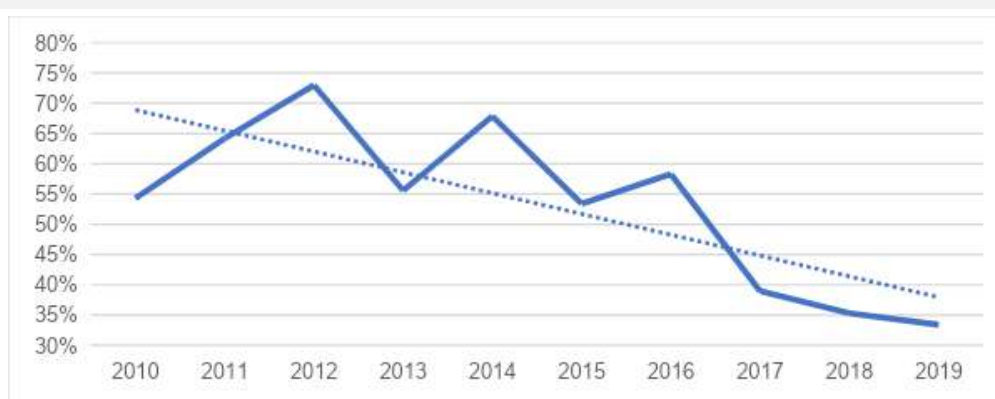
Source: Authors' elaboration based on OECD-DAC data.

Concessional financing provided by the MDBs to the regions' countries is markedly lower than that provided by other bilateral and multilateral institutions. As in other regions of the world, climate change funds received by countries in the region still enjoy high levels of concessionality. In fact, almost 50% of climate change financing in the region is granted on concessional terms, although the proportion of financing granted on concessional terms by the MDBs is markedly lower than that of other sources (barely 8% of total credits granted). Bilateral sources have granted almost 98% of their financing on conditional terms and the rest of the multilateral funds have granted 76%. However, over the last few years, concessional climate finance has been losing relative importance (Figure 17). The significant expansion of MDB financing has led to changes in the conditions of climate change financing. Given the low share of concessionality in climate change

⁹ The available data correspond to the amounts of approvals expressed in current dollars, but similar information on disbursements actually made is not available. This information is partial and not necessarily consistent.

financing for the co region's countries, the persistent increase in approval amounts has led to a significant drop in the relative importance of this type of financing over the past decade. This reduction in concessional financing will require the development of large portfolios of projects that are bankable under market conditions.

**Figure 17. Concessional Climate Financing in Latin America. n and Caribbean Countries
(as a percentage of total climate finance)**



Source: Authors' elaboration based on OECD-DAC data.

The distribution pattern of concessional funds shows, with exceptions, that lower-income countries are the main recipients of concessional financing. The small island countries of the Caribbean, which do not belong to the group of high-income countries, are beneficiaries of concessional funds for climate change. The rest of the countries in the region have access to widely varying percentages of concessional financing, which seem to be slightly linked to their per capita income levels. It should be noted that the distribution of conditionality depends, in part, on the type of institution providing the funds, with conditionality generally being lower the greater the proportion of MDB funds the country receives.

Most of the climate change funds allocated to the countries of the region correspond to mitigation projects. Only 31% of the funds allocated to climate change in the regions' countries are for adaptation projects (OECD-DAC information). The percentages vary considerably depending on the funding agency. The source of financing with the lowest proportion of funds earmarked for adaptation (25%) corresponds to the MDBs. It is striking that, being the non-private source with the lowest concessional financing, multilateral institutions are the source of financing with the highest proportion of funds earmarked for mitigation (75%). In the case of bilateral sources and other multilateral funds, more than 60% of the funds provided are earmarked for financing mitigation projects.

MDB climate financing consists almost entirely of loans, with sovereign guaranteed loans predominating. More than 98% of MDB climate finance approvals are granted through loans, while 1.3% of total funds are

grants, and only 0.4% are *equity-based*. This is markedly different from the rest of the climate change funding agencies, among which grants are much more widespread. In fact, bilateral agencies provide about 44% of their climate change funding in the form of grants, and the other Multilateral Funds provide 56.3% of their funding in the form of grants. In both cases, after grants, the other almost exclusive instrument is debt. It should be noted that climate change financing through *equity* or debt forgiveness operations is of minor relative importance.

Regional MDBs are the main financiers of climate change in the region's countries. In fact, regional and international multilateral financial institutions together account for almost 66% of climate change financing in the region, the three main ones being the IDB, the CAF-Development Bank of Latin America and the World Bank (Table 5). The first two account for almost 50% of total financing and 75% of total resources allocated to climate change projects. The regional MDBs do not present a particularly high percentage of financing for adaptation projects. Both the IDB and the CAF oscillate between 24% and 28% for adaptation, a percentage that represents less than half of what is channeled to the countries of the region through the World Bank. Among the extra-regional MDBs, the European Investment Bank (EIB), which financed an average annual amount of USD 600 million, equivalent to 7% of the total financed from MDBs, to countries in Latin America and the Caribbean between 2017 and 2019, stands out.¹⁰

¹⁰ The EIB is the leading MDB in climate change financing, surpassing the World Bank in volume of financing and providing funds not only in Europe.

**Table 5. Approvals for climate change in Latin America and the Caribbean
(in millions of USD and %)**

| | Average amount in USD 2017-19 | Percentage of total | | | |
|---------------------------------------------|-------------------------------------|---------------------|-------------------|-------------------|-------------------|
| | | 20 17 | 2018 | 20 19 | 201 7-19 |
| IBRD | 1.340 | 10, 7 | 9,4 | 10, 9 | 10, 3 |
| IDA (International Development Association) | 139 | 0,6 | 1,2 | 1,5 | 1,1 |
| Sub-total World Bank Group | 1.479 | 11, 3 | 10, 6 | 12, 4 | 11, 4 |
| IDB | 3.061 | 20, 6 | 25, 0 | 25, 4 | 23, 5 |
| IDB- Invest | 765 | 5,7 | 4,4 | 7,8 | 5,9 |
| Sub-total IDB Group | 3.826 | 26, 4 | 29, 4 | 33, 2 | 29, 4 |
| CAF - Development Bank of Latin America | 2.599 | 23, 0 | 20. 7 | 15. 3 | 20. 0 |
| European Institutions (EIB) | 600 | 3,3 | 4,4 | 6,5 | 4,6 |
| Other MDBs | 53 | - | - | 1,4 | 0,4 |
| Total BDMs | 8.558 | 63, 9 | 65, 1 | 68, 7 | 65. 7 |
| CIF (Climate Investment Funds) | 89 | 1,2 | 0,5 | 0,4 | 0,7 |
| GEF (Global Environment Facility) | 215 | 1,9 | 0,4 | 2,8 | 1,7 |
| GCF (Green Climate Fund) | 429 | 0,8 | 7,3 | 1,8 | 3,3 |
| Other funds | 72 | 0,7 | 0,3 | 0,7 | 0,6 |
| Total other multilaterals | 804 | 4,5 | 8,5 | 5,7 | 6,2 |
| Bilateral | 3.602 | 31, 3 | 26, 2 | 24, 8 | 27, 7 |
| Private donors | 53 | 0,2 | 0,2 | 0,8 | 0,4 |
| TOTAL CLIMATE CHANGE FINANCING | 13.016 | 10 0,0 | 10 0,0 | 10 0,0 | 100 ,0 |

Source: Authors' elaboration based on OECD-DAC data.

X.2. THE NEW REALITY OF FINANCIAL MARKETS

Investors are now explicitly incorporating ESG factors into their investment analysis processes. They have developed specific scoring systems to assess current and projected conditions in countries concerning their national environmental, social and institutional sustainability efforts and to facilitate cross-country

comparisons. There is also growing concern among financial institutions and governments about the risks that climate change poses to the continued financing of certain types of investments. The risks posed by the possibility of significant economic losses can be due to extreme weather events, for example, or due to the constitution of various stranded assets that cannot continue to be used, such as investments associated with fossil fuels. These losses can have a significant impact on the fiscal revenues and expenditures of governments and on the situation of financial institutions.

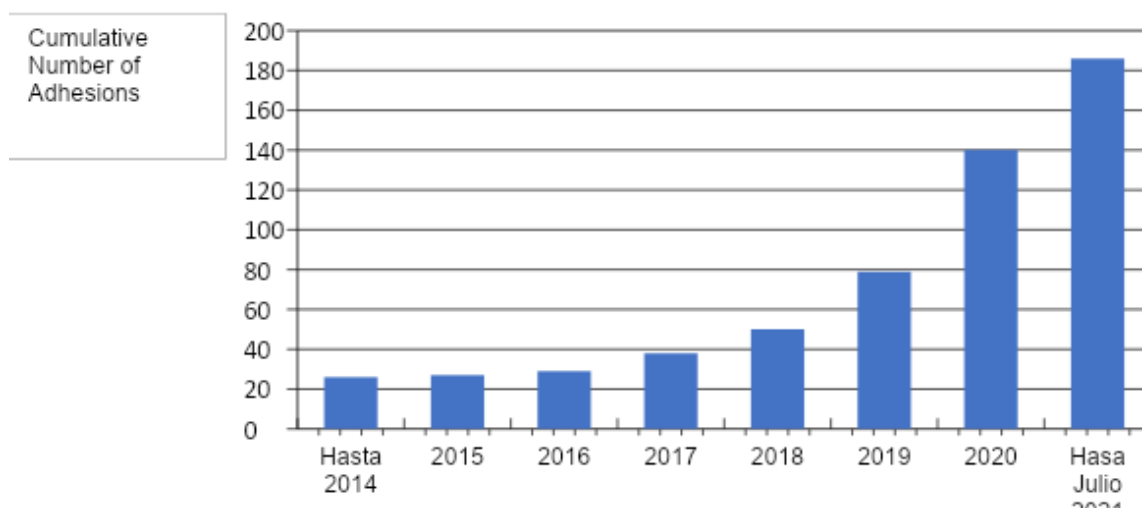
- Regarding environmental sustainability, the criteria considered are related to climate change mitigation and adaptation efforts, promotion of the use of renewable energies, protection of ecosystems and biodiversity, and investments aimed at reducing water, soil and air pollution levels. This includes, in a broad sense, the construction of an economic and social infrastructure that strengthens the economy's resilience to the impacts of climate change and increases economic efficiency.
- Concerning the social sustainability of the development style, financial actors are paying increasing attention to issues related to social and income inequality, gender equity, the adoption of practices and behaviors that improve health, investment efforts in education and training, and the construction of universal social protection systems and care for children and the elderly.
- The influence of institutional factors on the sustainability of economic and social development processes has also led international investors to pay attention to factors related to the effectiveness of governmental action, transparency in public management, full respect for the rule of law, the fight against corruption, political stability and the independence of the Judiciary.

Although the origin of ESG criteria dates back several decades, during the last few years they have become an unavoidable reference for the definition of socially responsible investment strategies, which seek to incorporate sustainability criteria in the process of study, analysis and selection of an investment portfolio. Initially, there were only a few rating agencies with technical teams specialized in sustainability that paid attention to these concepts and who were in charge of delivering the information that these agencies provided to their clients. Since 2020, there has been a significant increase in the analysis and demand for information on environmental and social issues by investors, which in many cases has been linked to the defining of specific sustainability strategies by investors. In fact, as shown in Figure 18, the number of financial market players that have adhered to the so-called Principles for Responsible Investment (PRI) has multiplied over the last few years.¹¹

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<https://www.unpri.org/download?ac=10970#:~:text=The%20PRI%20defines%20the%20investment%20in%C3%B3n, exercise%20assets%20of%20the%20property.>

Figure 18. Signatories to the Principles of Responsible Investment in Latin America and the Caribbean countries



Source : <https://www.unpri.org/signatories/signatory-resources/signatory-directory>.

To date, two types of thematic sovereign bonds inspired by the PRI have been issued. On the one hand, there have been issuances that establish a specific use of the funds obtained (*UoP Model*). Generally, the resources raised through this type of issuance are oriented to finance projects or budgetary expenditures that demonstrate environmental and social impacts consistent with the PRIs (Table 6).

In the case of green bonds, the resources obtained are usually allocated to projects of renewable energy generation, energy efficiency, sustainable management of natural resources, biodiversity conservation, clean transport, and the ecological and sustainable buildings' construction. In the case of social bonds, funds are applied, for example, to projects of basic infrastructure development, promoting access to essential services, housing construction and job creation.

On the other hand, sustainable bonds aim to finance projects generally associated with advancing the Sustainable Development Goals agenda. There is also the possibility of obtaining resources in the market under the criterion of using funds for general purposes based on performance indicators (*Sustainability-Linked Bonds*). In this case, the issuance design criteria must be based on specific quantitative metrics (*Key Performance Indicators, KPIs*) through which the sovereign issuer commits to achieve a certain target in sustainable results in a given period of time (*Sustainability Performance Target, STP*). In these financing modalities, the financial cost may be contingent on achieving a certain value of the selected *KPI(s)* within a predefined time horizon. ICMA has published voluntary guidelines based on four pillars (selection of indicators, calibration of sustainable development objectives, contingent financial characteristics of the bond, reporting and verification).

Table 6. Social and Sustainable Green Emissions in Latin America and the Caribbean

| | <i>Green</i> | <i>Social</i> | <i>Sustainable</i> | <i>Total</i> |
|---------------------------------------------|--------------|---------------|--------------------|--------------|
| Total amount issued (in billions of USD) | 30,2 | 8,6 | 9,7 | 48,6 |
| Number of Emissions | 169 | 37 | 40 | 246 |
| Number of Emitters | 91 | 28 | 26 | 132 |
| Countries | 12 | 10 | 9 | 14 |
| Coins of denomination | 11 | 10 | 6 | 14 |

Source: *Latin American and Caribbean Sustainable Finance State of the Market - Climate Bond Initiative (2021)*, IDB

From 2019 onwards, LAC countries have witnessed a notable expansion of thematic bond issues (green, social and sustainable bonds), both by sovereigns and by financial institutions and companies belonging to a broad spectrum of sectors and economic activities. Overall, by mid-2021, green, social and sustainable bond issuance reached a total amount of just under USD 50 billion. The number of issues was around 250 by 132 issuers from 14 countries.

Green bonds accounted for most of the operations, representing 62.1% of the total amount issued and 68.7% of the issues, followed in decreasing order of importance by sustainable bond issues, which accounted for almost 20% of the total amount issued and 16% of the number of issues made. The 37 issues of social and sustainable bonds totaled USD 8.6 billion, which implies a relative participation in the total amount issued of around 17%.

X.3. THEMATIC BOND MARKET IN THE REGION

Climate transition financing has continued to grow rapidly in the region. According to data from Climate Bonds Initiative¹², between September 2019 and June 2021, the issuance of Green, Social and Sustainable (GSS) bonds increased exponentially (Figure 16). Green bond issuance increased in less than two years from USD 13.6 billion to USD 30.2 billion annually. As for bonds categorized as social and sustainable, their issuance increased even more, totaling a cumulative total of USD 18.3 billion since the opening of these segments in 2016.

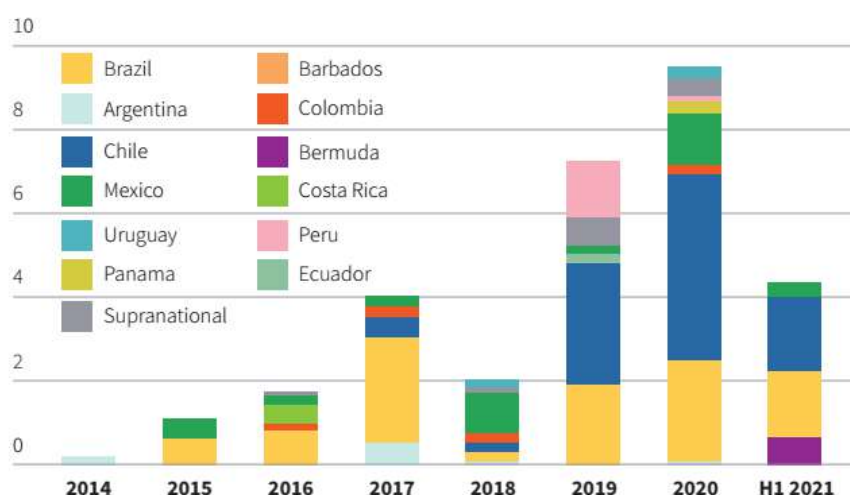
Total issuance in GSS bonds was USD 16.3 billion in 2020 (an 82% increase over the total amount issued in 2019) and already reached USD 12.5 billion between January and June 2021. The recovery that Latin American economies are experiencing now that the strongest effects of the Covid-19 pandemic are left

¹² Climate Bonds Initiative is an international non-profit organization focusing on investors: <https://www.climatebonds.net/resources/reports/latin-america-caribbean-sustainable-finance-state-market-2021>.

behind suggests a promising future for the financing of large infrastructure projects aimed at mitigating and adapting to climate change as well as initiatives aimed at closing the persistent gaps in terms of gender and meeting basic needs that exist in the countries of the region.

In the region, the sustainability financing market is in the midst of a diversification phase. Currently, and in line with what has been happening in global markets, green bonds have the largest market share, accounting for 62% of total GSS bond issuances. However, the recent growth of social and sustainable bonds indicates these categories' strong potential. The emerging development of issuances of social and sustainable bonds in local currency is evidence of the commitment of issuers and investors to these thematic bond categories.

**Figure 19. Green bond issuance in countries of the region
(2014 - June 2021)**



Source: Climate Bonds Initiative (2021)

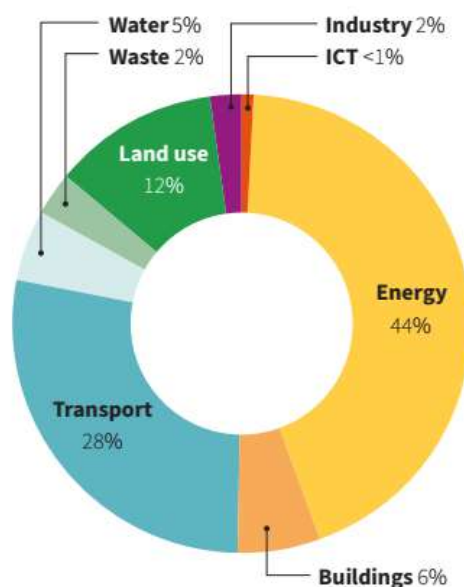
After a significant decline in green bond issuances in the region in 2018, the market shows signs of recovery starting in 2019 (issuances multiplied by 3.5 between 2018 and 2019). The 2020 and 2021 records confirm this trend: in 2020, issuances increased 33% compared to 2019, and in the first half of 2021, half the value of 2020 issuances had already been reached. Brazil is the leader in the region in terms of the total amount of green bond issuance. Bonds issued by Brazil represent one-third of the green bond stock issued in the region, totaling USD 10.3 billion. They are followed in decreasing order of importance by Chile with 31% (USD 9.5 billion) and Mexico with 13% (USD 4 billion). Green bond issuance in Chile is mainly driven by sovereign bonds. In contrast, in Mexico, this process is led mainly by the non-financial private sector.

The green bond market is diversifying both in terms of issuers and countries where green bonds are issued. Since the beginning of 2020, 25 new issuers have debuted in the market, mainly from Brazil (17) and Mexico (3). Of the total of 25 new participants, 19 are private entities, which shows the growing appetite of the private sector for this type of instrument. There are now 12 issuing countries in the region, a significant increase from 8 countries in 2019. The four new participants are: Barbados, Bermuda, Ecuador and Panama. Except for the Brazilian and Mexican markets, there is not much diversification in terms of issuers

in the region. In Brazil, diversification is associated with the entry into the market of issuers from the corporate financial sector.

The energy and transportation sectors clearly dominate regarding uses of funds raised from green bond issuances (Figure 20). Green bond issuances used to finance projects related to the energy sector increased by a factor of more than two between September 2019 and June 2021. However, due to the proportional increase in issuance for other purposes, its share of total funds financed through green bonds remained constant over the period. Bonds issued by six countries - Argentina, Bermuda, Barbados, Costa Rica, Uruguay and Peru - accounted for more than 95% of the funds in this sector. The year 2020 was a record year for green bonds issued to finance the energy sector in the region, with a total amount issued equivalent to USD 3.2 billion.

Figure 20. Sectors financed through the issuance of green bonds in LAC



Source: Climate Bonds Initiative (2021)

For all issuing countries, the energy sector is the largest recipient of financing obtained through green bonds, except for Chile, where the transportation sector is in the first place (this is due to the issuance of sovereign bonds whose funds have been applied to a large extent to that destination). This trend could change as both Mexico (an important player in this market) and supranational issuers are diversifying the sectors to which they allocate funds. In this sense, the share of the energy sector as a recipient fell from 80% to 60% in Mexico and from 40% to 31% for supranational issuers in less than two years.

Issues destined to finance the transportation sector represent 28% of the total for all LAC countries. 2020 saw a record issuance for this sector (USD 4.2 billion).

LAC maintains the particularity of allocating a higher proportion than the world average to financing land use and management through the issuance of green bonds. This is consistent with the generation of greenhouse gases derived from land use change. The share of this sector in the total use of funds obtained through

green bonds is estimated at 12.1%, while the global share of this sector is approximately three times lower (3.8%). Issuance destined to finance projects associated with land use and management have remained constant at around USD 1 billion annually. Due to the increase in the financing of other sectors, the use and management of soils have lost relative weight, reducing by almost half (it was 20% in September 2019) in less than two years.

A salient feature of the allocation of funds raised through green bonds is the low relative participation of the construction and water sectors. The sector accounts for just 6% of green bond issuance, contrasting with 27% globally, although this trend may be showing signs of reversal. In fact, 2020 set a record for construction sector financing, with a value of USD 7.6 billion. Finally, while the region allocates only 5% to investments to improve access and water-related infrastructure, the world allocates almost twice as much (10%).

Public and private sector issuance in LAC countries differs in terms of the sectors to which financing is allocated. The public sector has a preference for energy sector issues (except for the Chilean government's sovereign bonds for financing the transportation sector). In contrast, the private sector is more diversified, although the share of the energy sector is on the rise. Both financial and non-financial corporate issuers increased their issuance to finance the energy sector. At the same time, non-financial corporate issuers increased their financing allocations to the construction sector.

Issuances are still primarily denominated in US dollars. However, the share of this currency has recently decreased from 70% in September 2019 to 60% in June 2021. This trend is explained by issuances denominated in reais and euros. Regarding the number of issues, bonds issued in reais (63 in total) almost equal those issued in US dollars (64 in total) between 2019 and June 2021. The second relevant currency for the region in terms of the cumulative value of bonds issued is the euro, with a 16.6% share of the total green bond market. However, this value (USD 5 billion) results from only six issues from three different issuers, positioning the euro as the currency of denomination with the highest average issue value in the region. This may signal an attempt by the region to attract funds from Europe or other foreign investors. The period September 2019 - June 2021 saw the appearance of bonds denominated in debut currencies, such as the Argentine peso, the Barbadian dollar or the Swiss franc, which is a sign of the consolidation of these instruments in the region.

The non-financial corporate sector shows the most diversification in terms of the denomination of its bonds, including nine different currencies for green bonds issued by this sector. Development banks follow on the list, issuing green bonds denominated in eight different currencies from 2019 to 2021. The share of issues equivalent to USD 500 million fell in the cumulative total from 61% in 2019 to 53% in June 2021. However, the amount of issues with this characteristic doubled in the same period. As can be deduced, there is a significant increase in smaller issues, which translates into a drop in average issues of 26% and a drop in median issues of 40% (Brazil, Chile and Mexico, leaders in large issues, also lead in relatively smaller issues). This suggests greater market diversification.

As of 2019, the share in the cumulative stock of green bonds issued with maturity dates longer than 10 years has increased. The relative importance of long-term bonds doubled from 14% to 30% in less than two years. This increase came at the expense of the medium-term bond category (maturity dates between 5 and 10 years), which decreased from 44% to 34% between 2019 and June 2021.

The largest contribution to the increase in the share of long-term bonds is that of the Government of Chile, with its sovereign green bond issuance program aimed at financing the transportation sector. This program

currently has a total of 8 issues, with average maturity dates of 19 years, for a value of USD 7,400 billion. Long-term bonds allow issuers to undertake larger projects while keeping the cost of financing constant throughout the process, which is particularly important for the public sector.

About 88% of the stock of green bonds issued in the region underwent some stage of external review. Likewise, 84% of the issues went through some external validation mechanism. These numbers are in line with the global green bond market. External reviews include the opinions of external reviewers, green bond ratings, certifications under climate bond standards, etc. The share of external reviewers' opinions decreased between 2019 and 2021, while the share of CCB (Climate, Community and Biodiversity) certification increased significantly. Currently, USD 15.2 billion in green bonds issued have been evaluated exclusively by external reviewer opinions, while USD 9.4 billion have received certifications. The increased importance of certifications as an external review mechanism is due to the leading role in issuance played by the Chilean government.

X.4. PUBLIC DEBT MANAGEMENT AND THEMATIC ISSUANCE OF SOVEREIGN BONDS

From the perspective of public debt management, the governments of Latin American countries face a double challenge in terms of sustainable financing. Some countries, especially those with the greatest increases in their debt levels and those with significant financial demands in the immediate future, will foreseeably have to restructure their commitments to their creditors (private investors and multilateral financial organizations). The restructuring of a large public debt appears to affect macroeconomic stability, but may represent an opportunity to undertake profound reforms in fiscal policies. In this context, possible negotiations on debt restructuring should be viewed as an opportunity to make progress on environmental and social sustainability.

Likewise, the changes taking place in institutional investors' behavior and in the lending policies of multilateral financial organizations show that access to financing is increasingly related to the debtor countries' commitment to climate change and the effectiveness of government actions in terms of environmental and social sustainability. In fact, the adoption of a financing policy that explicitly incorporates the sustainability of the development style becomes a fundamental axis. To move in this direction, countries will have to mobilize resource flows with environmental and social criteria and objectives, with concrete and verifiable positive impacts that will make it possible to close the post-Covid-19 economic and social gaps without compromising the sustainability of environmental resources.

The transformation that has been taking place in the strategies of institutional investors over the last two years has prompted the region's governments to make more frequent incursions with thematic bond issues into the international markets. Financial innovations related to environmentally sustainable development are in an expansive phase. It can even be argued that the rapid progress being made in the financial markets is a lever that can accelerate the abandonment of practices and behaviors that lie at the root of the unsustainable nature of the current (inertial) development trajectory. From 2019 to 2023, more than two dozen sovereign-guaranteed thematic bond issues have been carried out in the region's countries.

XI. CLIMATE CHANGE AND FINANCIAL RISKS

There is growing evidence that the financial sector is exposed to the impacts of climate change and that it has a fundamental role to play in the construction of a new carbon-neutral economy. Climate change affects economic activities, social welfare and the environment resulting in additional losses and risks in banks' portfolios and the prices of financial assets. Additionally, the shocks and risks derived from the process of climate transition (basically mitigation) to a zero net CO₂ emissions economy entail risks and greater volatility in the financial sector.

These climate change shocks are not properly incorporated into financial asset prices, risk management and financial institutions' balance sheets. This is the consequence of a double market failure. First, climate change represents a global negative externality (Stern, 2006) where high uncertainty persists about the monetary valuation of the costs it causes. Secondly, market failures in financial activity result in an undervaluation of the risks derived from climate change (Campiglio and Van der Ploeg, 2021).

There is a growing recognition that the risks inherent in climate change can impact financial stability (Batten, 2018, Campiglio and Van der Ploeg, 2021). This even implies systemic risks known as a "climate Minsky moment" (Carney, 2019) or as a *Green Swan Event* (Bolton *et al.*, 2020). However, the financial system has difficulties in incorporating these risks and the business opportunities offered by the new green economy (Campiglio and Van der Ploeg, 2021). This is shown, for example, by the well-known "irrational apathy" of the financial sector regarding the Paris Agreement on climate change (Daumas, 2021).

The financial sector's difficulties to internalize the costs and opportunities offered by climate change and the new green economy are a consequence, among other factors, of information failures and the presence of incomplete financial markets (Stiglitz and Weiss, 1981). This is reflected in difficulties for efficient intergenerational arbitrage with the well-known tragedy¹³ of horizons¹⁴ (Carney, 2015; Krogstrup and Oman, 2019), manifested in the presence of frictions, arbitrage and adjustment costs and generating inefficiencies in the allocation of resources. This type of situation is clearly illustrated in the carbon market, where high uncertainty persists about the carbon price and its evolution (Daumas, 2021). This reality suggests that adjustments through the market exclusively may be insufficient given the urgency and magnitude of the transformations required to transition to a low-carbon economy and that concerted action between the public and private sectors is therefore pertinent.

Recent surveys in the financial sector show that there is an increasing incorporation of physical and transitional climate risks in the financial sector (Amel-Zadeh, 2018; Harnett, 2016 and Krueger *et al.*, 2020), although this incorporation is not yet systematic (Delgado, 2019 and Frisari *et al.*, 2020). A global survey under 34 central banks indicates that 97% of participants do not explicitly include weather-related risks in stress tests. However, 59% consider building scenarios with weather into their stress test models (Central Banking, 2019). Similarly, at an international level, there is growing recognition (85% of respondents between 2017 and 2020) of the relevance of climate risks for the financial sector (TCFD, 2020). In addition, a recent

¹³ Frisari *et al.*, 2020 and Bank of England Governor's speech on the tragedy of horizons in Bank of England (BoE, 2015), <https://www.bankofengland.co.uk/speech/2015/brakingthetragedyofthehorizonclimatechangeandfinancialstability>.

¹⁴ Financial actors consider time horizons shorter than those where climate change damages will materialize.

survey in the financial sector in Mexico indicates that the most of the respondents recognize environmental risks. However, about half did not consider these risks to have relevant impacts on the risk management of financial institutions (particularly in fixed-income sovereign debt securities). A smaller proportion of respondents believe that implementing an environmental and social risk system can help identify business opportunities and that incorporating environmental and social risks can help reduce financial and reputational exposure in the financial sector, but that these assessment systems (SARAS) are at an early stage or under construction (Banco de México and UNDP-Inquiry, 2020).

XI.1. CLIMATE CHANGE PHYSICAL RISKS' IDENTIFICATION

Analyses of the direct impacts of climate change on economic activities show, with a high level of uncertainty, relevant economic costs that increase, in a non-linear fashion, with the increase in temperature. There is evidence that climate change has effects on all economic activities, labor productivity, energy demand, agricultural yields, migrations, ecosystems and where irreversible and even catastrophic impacts are expected (Krogstrup and Oman, 2019; Dell et al., 2014; Dietz and Stern, 2015). These impacts are usually more intense in developing or poor countries with warmer climates.

Thus, for example, some studies project potential impacts of 9% of GDP by 2100 in an inertial scenario (Business As Usual) (IMF, 2017, 2019),¹⁵ while with a temperature increase of 4° C, the impacts are estimated at 23% of GDP (Burke et al., 2015). Moreover, the emerging climate economics literature estimates that climate change negatively impacts the growth rate of GDP *per capita* or GDP in the long run by impacting development prospects. In general, it is estimated that a 1° C increase in temperature translates into a 1% to 2% reduction in the average annual growth rate (Dell et al., 2014) (Table 7).

¹⁵ In this text, adaptation options are not included.

Table 7. Effects of temperature on product growth rate.

| | Temperature increase | Impact on GDP |
|--------------------------|----------------------|-----------------------------------------------------------------------------------------------------------------|
| Dell et al. (2014) | 1 C° | between -1% and -2% in the growth rate of poor countries. |
| Dell et al. (2009) | 1°C | -1.4% in the per capita income growth rate of poor countries. |
| Dell et al. (2012) | 1°C | between -1.35% and -1.39% of global GDP; -2.66% in agricultural GDP; 2.04% of industrial GDP in poor countries. |
| Acevedo et al. (2018). | 1 C° | -0.9% of the global growth rate and -1.2% in developing countries. |
| Kahn et al. (2019) | 1 C° | -1.03% in the overall GDP growth rate. |
| Jain et al. (2018) | 1 C° | -2.5% in India's GDP growth rate |
| Jain et al. (2020) | 1 C° | -2.5% in India's GDP growth rate. |
| Jones and Olken (2010) | 1 C° | between -2.0% and -5.7% in the average growth rate of exports from poor countries. |
| Colacito, et al. (2019), | 1 C° | between -0.27% and -0.45% of the U.S. GDP growth rate. |
| Hsiang (2010) | 1 C° | -2.4% in the rate of product growth. |

Source: Authors' elaboration.

These climate change impacts affect the credit and asset portfolios of banks and insurance institutions. During the last few years, several analyses have been developed for the management of risks arising from climate change, including *value-at-risk* models and *growth-at-risk* models (Adrian *et al.*, 2018; Andersson *et al.*, 2016; Dietz *et al.*, 2016; Brownless and Souza, 2021). These models show a clear relationship with risk analysis in the financial sector.

XI.2. RISKS ASSOCIATED WITH GHG EMISSION TRAJECTORIES: STRANDED ASSETS

The risks of the climate transition to a carbon-neutral economy are mainly concentrated in the risks derived from GHG mitigation processes (Krogstrup and Oamna, 2019). The transition to a carbon-neutral economy requires implementing large-scale structural transformations in a short time (between three and five decades). This requires large-scale investments in low-carbon activities and the construction of new infrastructure. At the same time, it requires intense disinvestment, accelerated depreciation and closure or reduction of activities in high-carbon sectors (Van der Ploeg and Rezai, 2020a, 2020b). The speed and magnitude implied by these structural transformations cannot be exclusively realized through the market and requires the active implementation of fiscal policies (including public investment) and various monetary and financial policies (Krogstrup and Oman, 2019).

Carbon budgets needed to meet climate scenarios of a temperature increase of 1.5° C or 2°C indicate that one of the main risks of the climate transition corresponds to the constitution of a large, varied and complex matrix of *stranded assets*. These assets are defined as those specific to carbon-intensive activities that depreciate rapidly or are retired before reaching their useful life (Campiglio and Van der Ploeg, 2021; Campiglio, 2016; Campiglio et al., 2018). Stranded assets are generated, firstly, by the implementation of various public policy strategies such as regulations, environmental fiscal policy (including the establishment of a carbon price) or the construction of new infrastructure. Secondly, they are generated by technological changes and, thirdly, by market changes, such as changes in relative prices or consumer preferences, or even demographic, social and cultural factors. These stranded assets are fundamentally shaped by the inability to use the natural resources of oil, gas and coal available in the subsoil and the need to reduce or stop using capital associated with carbon-intensive activities (Campiglio and Van der Ploeg, 2021).

The magnitude of these stranded assets can be illustrated by considering carbon budgets consistent with the 1.5° C and 2° C temperature rise climate scenarios.¹⁶ Meeting global oil and gas production targets entails emissions in excess of the emissions trajectory set by the 1.5° C target (SIET, 2019). Global stranded assets under the 1.5° C and 2° C temperature increase scenarios are estimated at about 35% in oil, 52% in natural gas and 88% in coal of the corresponding total reserves (McGlade and Ekins, 2015). On the other hand, the lifetime use of current energy, electricity, industrial and transportation infrastructure implies emissions of about 650 GtCO₂, which are inconsistent with emissions of 420-580 GtCO₂ to reach the 1.5° C target and which represent about 2/3 of the emissions of the 2° C target (Tong et al., 2019; IDB and DDPLAC, 2019).

By 2035, Oil production should be reduced to less than 4 million barrels per day in Latin America and the Caribbean (this represents approximately 60% less oil production compared with numbers prior to Covid-19). This reduction has particularly relevant effects in countries with high oil exports. For example, public revenues derived from oil and gas as a proportion of total public revenues between 2013-2018 represent 8.3% for Bolivia, 8.0% for Ecuador, 5.4% for Mexico and 2.5% for Colombia (OECD, 2020; Delgado et al., 2019) and where a drop in oil demand derived from the Paris Agreement is also expected. Emissions associated with power plants in Latin America and the Caribbean are also incompatible with the goal of a temperature increase of 1.5° C (González-Macheda et al., 2019).

¹⁶ Leaton (2015) estimates global potential stranded assets at USD 2 trillion, and Diezt *et al.* (2016) USD 2.5 trillion.

XI.3. RELEVANCE OF CLIMATE TRANSITION RISKS TO THE FINANCIAL SYSTEM

The accelerated structural transformation of the economy to meet the challenges of climate change implies alterations in the cost, revenue and profitability flows of companies (flow risks) and changes in the valuation of certain assets (*stock risks*) (Campiglio and Van der Ploeg, 2021). Changes in flows and in the value of stranded assets have consequences for the financial system, which does not efficiently incorporate these adjusted values derived from climate change into its financing. These new values must result in changes in asset values and an increase in the interest rate to incorporate the new climate risks (Semieniuk et al., 2021). This indicates that climate change risks are clearly undervalued by financial intermediaries (Hong et al., 2019).

Thus, climate transition risks can result in financial instability through their effects on asset values, funding levels, interest rates, exchange rates and inflationary pressures (Campiglio and Van der Ploeg, 2021; Campiglio, 2016; Stolbova and Battiston, 2020). Leaton (2015), for example, argues that there are significant risks of stranded assets in terms of the available carbon budget, which financial asset prices are not incorporating, and that, on the contrary, the London and New York stock exchanges are increasing their carbon content, even with the possibility of a *carbon bubble*.

The financial system is gradually internalizing climate risks. The financial sector internalizes the effects of climate change by charging a risk premium for more carbon-intensive investments and discounting various control factors and the fact that this risk is greater in countries with stricter regulations or with a large oil sector (Bolton and Kacperczyk, 2021a, 2021b; Delis et al., 2021; Ehlers et al., 2021; Baldwin et al., 2020). This process of internalizing risks also happens in stock portfolios of food companies, where natural disasters have strong impacts (Hong et al., 2019).

However, some inefficiency persists in financial markets concerning carbon content or green portfolios (Daumas et al., 2021). Investments do not adequately penalize the risk associated with carbon-intensive activities (*carbon premium*) (Bernardini et al., 2021; Gorgen et al., 2020). Under the Basel Accord, for example, equity requirements for climate risks are not yet explicitly included, so these risks are likely to be underpriced (Krogstrup and Oman, 2019). There is also a lack of recognition that mitigation processes in climate transition can generate significant specific and global co-benefits (*The social value of mitigation actions*, SVMA).

Available evidence indicates that there is also, at least partially, a bias in favor of green investments, which manifests itself in, for example, terms of interest rates, maturities or requirements that are more flexible for green projects or green asset purchases (Green Quantitative Easy) (Ferrari and Landi, 2020; Matikainen et al., 2017). This suggests the presence of a potential *green premium* that may even trigger the potential risk of a green bubble.

Thus, the financial system faces serious risks that derive from the climate transition and are not efficiently incorporated into its risk management and may even lead to carbon bubbles. In this sense, the challenge for the financial sector is to incorporate these risks systematically.

XI.4. INITIATIVES TO ADDRESS CLIMATE RISKS IN THE FINANCIAL SYSTEM

Several initiatives in the financial system seek to internalize the risks arising from climate change. Notable among them is the Financial Stability Board's Task Force on Climate-Related Financial Disclosures which aims to identify and better understand the impacts of climate change on the financial system (TCFD, 2020). The Network of Central Banks and Supervisors for Greening the Financial System (NGFS) was created in 2017 with the objective of generating, sharing and distributing knowledge on the impacts of climate change on financial markets and understanding the role of regulation and supervision, considering that climate risks are sources of financial risks and should therefore be included in the regulation and supervision of financial systems. In France, England and Brazil, there are indications for banks to report their ESG risks arising from climate change in line with the Ecuador Principles (NGFS, 2018; Bank of England, 2019th; Banco Central do Brasil, 2011; Frisari et al., 2020). The International Organization of Pension Supervisors (IOPS) developed voluntary guidelines for integrating social, environmental and governance (ESG) goals in the areas of risk management and investment supervision of pension funds. The Prudential Regulation Authority (PRA) developed guidelines in 2019 seeking to assign responsibilities for identifying and managing financial risks related to climate change to senior management at financial institutions.

Various analyses seek to incorporate the risks of the climate transition into monetary policy. That is, monetary policy may be affected by public policy regimes related to climate change. The imposition of a carbon tax, for example, may induce a fall in output and an increase in the inflation rate, which, in an inflation-targeting regime, increases the interest rate. Thus, carbon price policies can be passed on to the inflation rate and a reduction in output, generating a supply *shock* that is difficult to deal with in an inflation-targeting regime, unlike demand *shocks* where high inflation, employment and output coexist and which are dealt with by movements in interest rates. Thus, a carbon price and inflation targeting policy scenario can cause reductions in long-run potential output levels through persistently high interest rates (Dikau and Volz, 2019; Fried et al., 2021). Similarly, Dafernos et al. (2018) argue that climate risks can reduce credit which would have economy-wide impacts. This can be addressed through a quantitative easing of monetary policy.

XII. CONCLUSIONS AND GENERAL COMMENTS

The objective of this study is to analyze the role of environmental fiscal policy and financing instruments in driving the transformations required in production and consumption patterns to support the climate transition in Latin American countries. The presentation aims to synthesize and organize the multiple dimensions that must be considered when designing national strategies for building a low-carbon and climate-resilient economy for the 2050 - 2070 horizon.

Over the last three decades, Latin America has shown a weak and volatile economic growth rate that has contributed to an increase in *per capita* income, consumption, employment and poverty reduction. However, this economic dynamism has been insufficient to address chronic poverty, the high concentration of income or the generation of formal jobs. It has generated a set of negative externalities that are eroding the current economic dynamism. Additionally, this style of development puts global goods such as the climate or public health at risk (COVID-19).

Climate change represents one of the great challenges of the 21st century, given its negative effects on economic activities, social welfare and the environment, and the efforts, resources and structural transformations required in current production and consumption patterns to implement mitigation processes.

Thus, the evidence shows that the impacts of climate change are significant, generalized throughout the economy and economic activities, in some cases non-linear and irreversible, and with more intense effects in poor and warmer countries. These impacts harm the long-term growth rate of GDP or GDP *per capita*, which negatively affects development prospects. In this sense, Latin America is particularly vulnerable to the impacts of climate change. At the same time, the Paris Agreement on climate change aims to stabilize the temperature increase between 1.5° C and 2° C during this century, which requires the global economy to be carbon neutral between 2050 and 2070.

The targets established in the Nationally Determined Contributions (NDCs) per country are, however, not consistent with the Paris Agreement and, moreover, do not adequately define the public policies to be applied.

Increasing the ambition of the NDCs requires implementing structural transformations to the current unsustainable development style. This is illustrated by current consumption patterns, which show a decrease in the share of food expenditure in total expenditure by income group (quintiles) as income increases. These new consumption spaces are covered by increased spending on private transportation (fossil fuels and automobiles), private education, private health and household appliances. This reflects the migration process from public transport to private transport, from public health to private health, from public education to private education, as a result of the growing dissatisfaction with the quality and services offered by these public services. This configures a society that is increasingly segmented and where greater use of private transportation makes compliance with mitigation goals more difficult. The greenhouse gas emissions trajectories for Latin America show that the inertial scenario is inconsistent with deep decarbonization. The orderly and disorderly mitigation scenarios that would lead to a carbon-neutral economy by 2050 require energy efficiency and decarbonization rates higher than the current ones. Moreover, the scenario where the start of the mitigation strategy is postponed to 2030 requires decarbonization rates that are implausible and most likely economically inefficient.

Addressing the challenge of climate change requires implementing a new fiscal and financing strategy that is consistent with deep decarbonization.

The implementation of a green fiscal strategy is based on the application of Pigou-type taxes where the polluter pays. By increasing the price of the polluting goods, these taxes seek to reduce its demand and encourage the production of substitute goods. Available evidence shows that these taxes are generally concentrated on energy (electricity, fuels) and water and increasingly incorporate tariffs on some economic activities (agricultural and industrial) and waste. There is also the application of a price on carbon. This carbon price could be included in a set of energy taxes, but there is still high uncertainty about its specific value. Various estimates suggest carbon prices ranging from USD 5 tCO₂ to USD 700 tCO₂.

The implementation of these taxes has been incorporated into green tax reforms (GTRs). These green tax reforms initially sought to use the new tax revenues to reduce other levies, such as those on social security, to promote employment. Currently, green tax reforms are broader, without defining the specific use of resources, but considering possible fiscal recycling processes. These green tax reforms also consider the effects of multiple dividends on economic dynamics and social welfare. They consider, for example, the

effects of weak or strong double dividends on GDP or income distribution or smart tax measures that can contribute to gender equality.

Evidence shows that environmental taxes generally reduce the negative externality but do not entirely control it. This is because the goods that caused the negative externality have a high-income elasticity and a low price elasticity of demand. Thus, in a scenario of continuous economic growth, small tax increases reduce the growth rate of demand but do not eliminate it. Furthermore, evidence shows that green taxes can have regressive income distribution effects, mainly on electricity, and progressive income distribution effects on fuels for private transportation and automobiles. Thus, green tax strategies should contemplate their potential collateral effects on the population's welfare and where fiscal recycling processes should be considered.

The magnitude of the structural transformations associated with green tax reform requires consideration of their viability and the political economy they imply. Therefore, the implementation of these fiscal reforms must be based on a broad social consensus that makes them viable and where the positive consequences for the population as a whole must be evident. In this sense, they must incorporate a contribution to improve income distribution.

Incorporating these structural transformations into the current style of development requires a financing strategy. The structural transformations needed to build a carbon-neutral economy between 2050 and 2070 imply several transition risks that significantly impact the financial system. Evidence shows that the financial system does not properly incorporate the risks of the climate transition. For example, it does not incorporate the risks implied by stranded assets that will transfer into abrupt changes in the value of bank assets and affect their balance sheets. This will result in a carbon bubble.

However, in recent years there has been a substantial increase in thematic financing associated, for example, with green, sustainable, climate or gender bonds. These types of financing represent a fundamental lever for transformation. However, it should be noted that the fulfillment of certain climate, social or gender targets increasingly accompany these financings. Non-compliance may result in higher payments. This can become an additional obstacle to development.

Thus, a new fiscal and financing policy consistent with a profound decarbonization of the economy is essential to implement the structural transformations required for the current style of development. These fiscal and financing strategies should not only consider the preservation of current fiscal balances but also build a new fiscal and public debt management paradigm.

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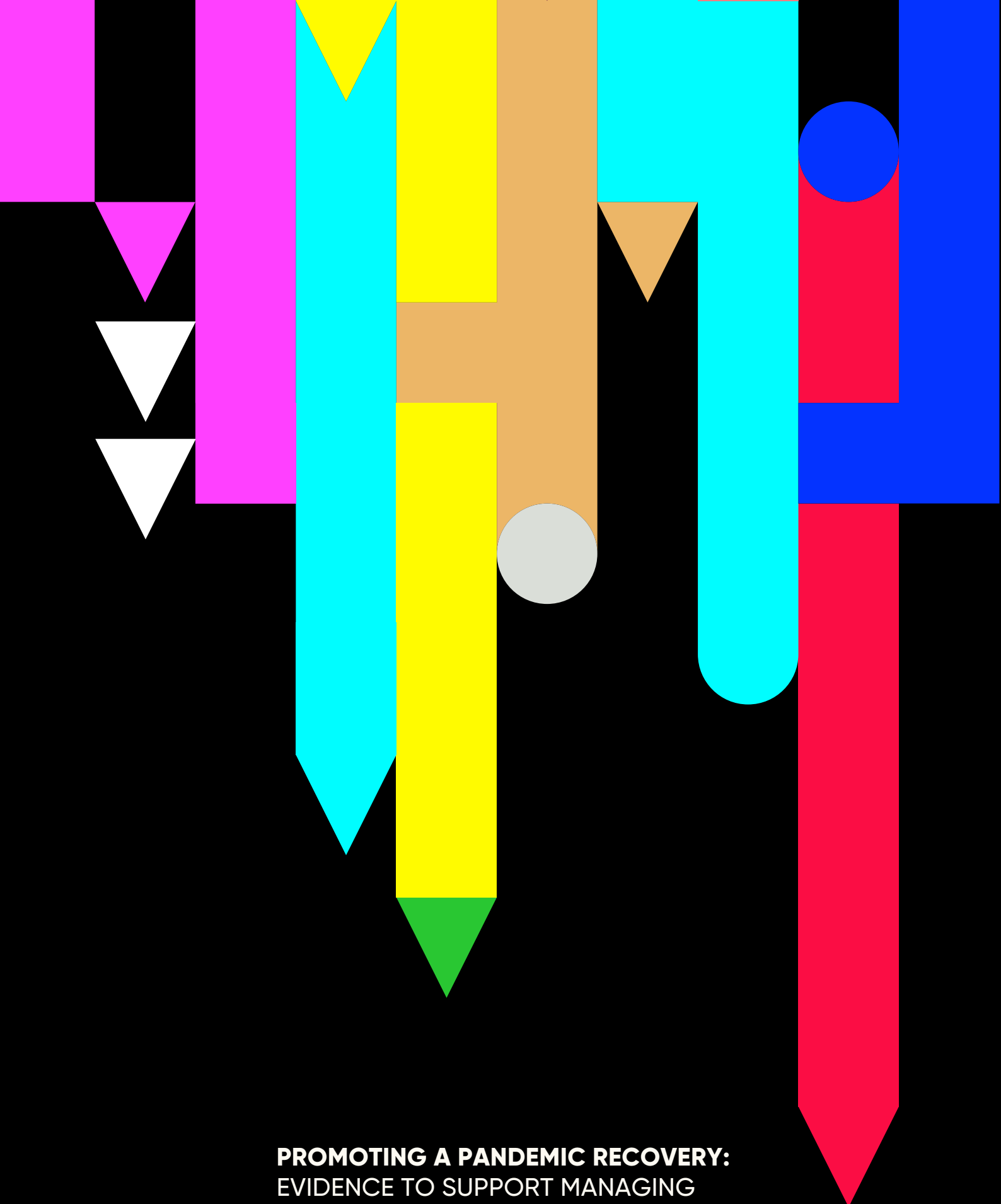
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