

FISCAL POLICY **AND CLIMATE CHANGE**

Recent Experiences of Finance Ministries
in Latin America and the Caribbean



Coordinated and edited by
**Raúl Delgado, Huáscar Eguino,
and Aloisio Lopes**



INTER-AMERICAN DEVELOPMENT BANK

FISCAL POLICY AND CLIMATE CHANGE

Recent Experiences of Finance Ministries
in Latin America and the Caribbean

Coordinated and edited by
Raúl Delgado, Huáscar Eguino, and Aloisio Lopes

Cataloging-in-Publication data provided by the
Inter-American Development Bank
Felipe Herrera Library

Fiscal policy and climate change: recent experiences of finance ministries in Latin America and the Caribbean / coordinated and edited by Raúl Delgado, Huáscar Eguino, and Aloisio Lopes.
p. cm. — (IDB Monograph ; 941)
Includes bibliographic references.

1. Fiscal policy-Environmental aspects-Latin America. 2. Fiscal policy-Environmental aspects-Caribbean Area. 3. Climatic changes-Government policy-Latin America. 4. Climatic changes-Government policy-Caribbean Area. 5. Executive departments-Environmental aspects-Latin America. 6. Executive departments-Environmental aspects-Caribbean Area. 7. Carbon dioxide mitigation-Economic aspects-Latin America. 8. Carbon dioxide mitigation-Economic aspects-Caribbean Area. I. Delgado, Raúl, editor. II. Eguino Lijerón, Huáscar, editor. III. Lopes, Aloisio, editor. IV. Inter-American Development Bank. Fiscal Management Division. V. Inter-American Development Bank. Climate Change Division. VI. Series. IDB-MG-941

JEL Codes: H0, H30, H50, H53, H60, O10, O20, O38, O54, Q01, Q20, Q50, Q56, Q588

Keywords: public sector economics, fiscal policy, public finance, public expenditure, national budget, green procurement, climate change, mitigation, adaptation, natural disasters, economic development, sustainable development, resilient infrastructure

Copyright © 2021 Inter-American Development Bank. This work is licensed under a Creative Commons IGO 3.0 Attribution-NonCommercial-NoDerivatives (CC-IGO BY-NC-ND 3.0 IGO) license (<https://creativecommons.org/licenses/by-nc-nd/3.0/igo/legalcode>) and may be reproduced with attribution to the IDB and for any non-commercial purpose. No derivative work is allowed.

Any dispute related to the use of the works of the IDB that cannot be settled amicably shall be submitted to arbitration pursuant to the UNCITRAL rules. The use of the IDB's name for any purpose other than for attribution, and the use of the IDB's logo shall be subject to a separate written license agreement between the IDB and the user and is not authorized as part of this CC-IGO license.

Note that the link provided above includes additional terms and conditions of the license

The opinions expressed in this publication are those of the authors and do not necessarily reflect the views of the Inter-American Development Bank, its Board of Directors, or the countries they represent.



Inter-American Development
Bank 1300 New York Avenue,
N.W. Washington, D.C. 20577
www.iadb.org

The Institutions for Development Sector was responsible for the production of this publication.
EXTERNAL VENDORS:

Production Editor: Sarah Schineller (A&S Information Partners, LLC)

Editor: Adrienne Pratt and Sheila Mahoney

Design: Sara Ochoa

CONTENTS

| | |
|-------------------------------------------------------------------------------------------------------|---------------|
| ABBREVIATIONS | 9 |
| ACKNOWLEDGMENTS | 10 |
| PREFACE | 11 |
| INTRODUCTION | 15 |
| Chapter 1 Decarbonization Strategies and the Role of Finance and Planning Ministries | 19 |
| Section 1. Long-Term Decarbonization Strategies and Their Relationship to Fiscal Planning | 19 |
| 1.1 Functions of Long-Term Strategies | |
| 1.2 Parties Involved in Long-Term Strategies | |
| 1.3 Policy and Regulatory Reform, Public and Private Investment, and Financing | |
| Chapter 2 Fiscal Impact of Decarbonization and Climate Change | 28 |
| Section 1. Stranded Asset Risk and Associated Fiscal Impacts | 29 |
| 1.1 Quantifying the Risks of Stranded Assets for Latin America and the Caribbean | |
| 1.2 Confronting Uncertainty through Fiscal Risk Analysis and Mitigation | |

Section 2. Review of Fossil Fuel Subsidies and Green Fiscal Reforms **36**

2.1 Options, Challenges, and Benefits of Green Fiscal Reforms

Section 3. Fiscal Impact of the Increased Frequency of Extreme Weather Events **40**

Chapter 3

Governance and Risk Management of Natural Disasters and Climate Change **44**

Section 1. Disaster Risk Governance and the Index of Governance and Public Policy in Disaster Risk Management **44**

1.1 Regulatory, Institutional, and Budgetary Conditions for Disaster Risk Management in Latin America and the Caribbean

1.2 Best Practices in Incorporating Natural Disaster-Related Risk into Public Investment

Section 2. Disaster and Climate Change Risk Assessment in Public Investment Projects **51**

2.1 Implementing Best Practices in Public Project Evaluation and Management

Chapter 4

Managing Public Spending on Climate Change **55**

Section 1. Identifying and Evaluating Public Climate Expenditures **56**

1.1 Relevance of Public Spending to Climate Action

1.2 Evaluation for Better Spending

1.3 Identification and Classification of Public Climate Spending: Progress and Lessons Learned in Latin America and the Caribbean

- 1.4 Key Advances in Latin American and Caribbean Countries and International Lessons Learned
- 1.5 Convergent Work Agenda of Finance and Planning Ministries on Climate-Related Public Expenditures

Section 2. Introducing Climate Change Criteria into Public Procurement **62**

- 2.1 Trends in the Implementation of Public Procurement for Climate Change
- 2.2 Benefits of Green Procurement
- 2.3 Life Cycle Costing
- 2.4 National and Sector Policies to Promote Green Public Procurement

Chapter 5 **71** **Sustainable Public Investment**

Section 1. Sustainable Infrastructure and Public Investment Management **71**

- 1.1 Challenges and Opportunities in Latin America and the Caribbean
- 1.2 Role of Sustainable Infrastructure Policies

Section 2. Green Buildings in the Public Sector **80**

Chapter 6 **84** **Financial Strategies for Climate Change and the Financial System Response to Climate Change Risks**

Section 1. Financial Strategies for Climate Change: From Defining NDC/LTS Goals to Implementing Them **85**

- 1.1 Features of a Climate Change Financial Strategy

Section 2. Financial Systems and the Risks Posed by Climate Change **90**

2.1 Progress in Latin America and the Caribbean

2.2 Sustainable Finance Roadmaps

Section 3. Instruments for Financing the Transition to
Zero Emissions: Sovereign Green Bonds **95**

Chapter 7

Sustainable Economic Stimulus Strategies in the Wake
of the Covid-19 Pandemic **99**

Section 1. Sustainable Economic Recovery in the Wake
of the COVID-19 Pandemic **100**

1.1 Investing for a Sustainable, Equitable, and Resilient
Economic Recovery

1.2 Financing Sustainable, Equitable, and Resilient Economic
Recovery

Annex

Natural Disaster Risk Management and Climate Change **108**

BIBLIOGRAPHY **113**

TABLES

| | |
|-----------------------------------------------------------------------------------------------------------------------------------------|-----|
| Table 1. Progress toward Identifying and Evaluating Climate Change-Related Budget Expenditure in Latin America and the Caribbean | 59 |
| Table 2. Most Common Areas of Public Expenditure for the Implementation of Green Procurement | 63 |
| Table 3. Conceptual Matrix of the Index of Governance and Public Policy in Disaster Risk Management (iGOPP) | 111 |

FIGURES

| | |
|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----|
| Figure 1. Decrease in Battery and Renewable Energy Costs Between 2010 and 2019 | 30 |
| Figure 2. Simulated Tax Revenue for Selected Latin American and Caribbean Countries Based on International Climate Goals and the Decisions of OPEC Producers, 2016-35 | 33 |
| Figure 3. Simulated Revenue from Energy Subsidy Reforms and Environmental and Carbon Taxes Yielding 2 Percent of GDP or More in 27 Latin American and Caribbean Countries | 37 |
| Figure 4. Frequency of Extreme Weather Events in Latin America and the Caribbean, 1980-2019 | 41 |
| Figure 5. Fiscal Impact of Extreme Climatic Events in Latin American and Caribbean Countries (by Income Group and Percentage of GDP) | 42 |
| Figure 6. Index of Governance and Public Policy in Disaster Risk Management (iGOPP), 2013-20 | 46 |
| Figure 7. Public Procurement as a Percentage of GDP, Worldwide and by Region | 64 |
| Figure 8. Typical Life Cycle Costs to Consider When Procuring a Product or Service | 67 |
| Figure 9. Process for Developing a Financial Strategy for Climate Action (adapted from E3G) | 90 |
| Figure 10. Regulatory and Supervisory Initiatives for Climate-Related Risks in Latin America's Financial System | 92 |
| Figure 11. Sustainable Finance Roadmap | 92 |
| Figure 12. Global Green Bond Issuance (US\$ billion) | 95 |

| | |
|--------------------------------------------------------------------------------------------------------------------------|-----|
| Figure 13. Required Fiscal Adjustment and Debt Levels in Latin America and the Caribbean (as a percentage of GDP) | 100 |
| Figure 14. iGOPP Scores in Latin America and the Caribbean, by Disaster Risk Management Component | 112 |
| Figure 15. iGOPP Scores in Latin America and the Caribbean, by Public Policy Phase | 112 |

BOXES

| | |
|----------------------------------------------------------------------------------------------------------------------------------------------|-----|
| Box 1. National Decarbonization Plan 2018-50 and the Role of Costa Rica's Ministry of Finance, National Planning, and Economic Policy | 24 |
| Box 2. Challenges of the Closure Plan for Coal-Fired Power Plants in Chile | 31 |
| Box 3. Example of Disaster and Climate Change Risk Assessment in the Caribbean | 51 |
| Box 4. Green Procurement: The Case of Buenos Aires | 66 |
| Box 5. The Cases of Chile and Costa Rica | 73 |
| Box 6. Mexico's Experience of Prioritizing Public Investment Programs and Projects | 78 |
| Box 7. Three Country Cases: Argentina, Brazil, and Colombia | 81 |
| Box 8. Financial Strategy for Climate Change in Chile | 88 |
| Box 9. Chile Issues the First Sovereign Green Bond in the Americas | 97 |
| Box 10. Costs and Benefits of the Decarbonization of Costa Rica's Transportation Sector | 102 |

ABBREVIATIONS

| | |
|-----------------|------------------------------------------------------------------------------------------|
| CPEIR | Climate Public Expenditure and Institutional Review |
| DDPLAC | Deep Decarbonization Pathways in Latin America |
| DRM | Disaster risk management |
| ENCE | Etiqueta Nacional de Conservação de Energia [National Energy Conservation Label](Brazil) |
| ESG | Environmental and social governance |
| GDP | Gross Domestic Product |
| GFLAC | Climate Finance Group of Latin America and the Caribbean |
| IDB | Inter-American Development Bank |
| IEA | International Energy Agency |
| iGOPP | Index of Governance and Public Policy in Disaster Risk Management |
| IMF | International Monetary Fund |
| INGP | Inter-American Network on Government Procurement |
| IRENA | International Renewable Energy Agency |
| LTS | Long-Term Strategy |
| MIDEPLAN | Ministry of National Planning and Economic Policy (Costa Rica) |
| MSMEs | Micro, small, and medium-sized enterprises |
| NDC | Nationally determined contributions |
| NGFS | Network for Greening the Financial System |
| OECD | Organisation for Economic Co-operation and Development |
| OPEC | Organization of the Petroleum Exporting Countries |
| SDGs | Sustainable Development Goals |
| TCFD | Task Force on Climate-Related Financial Disclosures |
| UNDP | United Nations Development Programme |
| UNDRR | United Nations Office for Disaster Risk Reduction |

ACKNOWLEDGMENTS

This publication was coordinated and edited by Raúl Delgado, Huáscar Eguino, and Aloisio Lopes of the Climate Change and Fiscal and Municipal Management divisions of the Inter-American Development Bank (IDB).

It is also the result of contributions from a number of bank sector specialists. The principal authors of each chapter are as follows:

- Chapter 1** Marcela Jaramillo
- Chapter 2** Adrien Vogt-Schilb and Luis Alejos
- Chapter 3** Sergio Lacambra, Ginés Suárez, Maricarmen Esquivel, and Daniela Zuloaga
- Chapter 4** Raúl Delgado, Aloisio Lopes, Juliana Almeida, Leslie Harper, and Daniel Sánchez
- Chapter 5** Huáscar Eguino, Marcia Bonilla-Roth, Mariana Silva, and Esperanza González-Mahecha
- Chapter 6** Marcela Jaramillo, Matías Gallardo, and Gianleo Frisari
- Chapter 7** Huáscar Eguino, Marcia Bonilla-Roth, Aloisio Lopes, and Raúl Delgado

We especially appreciate the valuable ideas, suggestions, and contributions of Adrien Vogt-Schilb, as well as the contributions made by Marcia Bonilla-Roth and Guy Edwards.

Translation into English by Jim Desrosiers, with final edit by Adrienne Pratt.

PREFACE



The investments needed to combat climate change have been described as a sacrifice that current generations must make for future generations, yet this statement is far from the truth. In the last 20 years, wind and solar energy have become the cheapest source of energy for many regions, and electric mobility is advancing rapidly.

Climate action represents an opportunity to restart economic growth after the COVID-19 pandemic. The decarbonization of our economies can create 15 million net new jobs by 2030, and every dollar invested in making infrastructure and economies more resilient can generate up to 4 dollars in economic benefits. Sustainable investments are also where cutting-edge technologies and the jobs of the future are to be found. Decoupling our economies from traditional models of investment in fossil fuels has become a requirement for maintaining competitiveness and ensuring the sustainability of public finances.

At the same time, there is the reality of the physical impacts generated by

climate change. A warmer planet means lower agricultural yields, greater potential for damage to infrastructure, and an increased risk of disease and death in Latin America and the Caribbean. The climate crisis is already affecting us all. Losses from natural disasters in recent years have devastated tourism, agriculture, and many other productive activities, yet this is only a taster of the severe impacts that will come in the decades ahead if we do not act to curb climate change.

Although governments are taking steps to alleviate the damage caused by the pandemic, much remains to be done to confront the climate crisis, and finance ministries can and should play a much greater role. Environment ministries have clear mandates for climate action and traditionally coordinate government actions in this area. However, the unprecedented level of transformation that must occur in all economic sectors demands the participation of all levels of government, sector ministries, the private sector, and other stakeholders. In May 2021, in response to a mandate

from its governors, the Inter-American Development Bank (IDB) presented a conceptual framework illustrating the need to mainstream climate change in order to generate true sustainable development. This vision calls for a central role for finance ministries. Indeed, given the responsibilities of these ministries for managing and evaluating public spending, budgeting, fiscal policy, and mobilizing private and international finance, they play a critical role in addressing climate challenges. Their ability to help strengthen interagency coordination mechanisms is essential for aligning government operations to achieve sustainable growth.

Finance ministries play an important role in managing public investment. Through them, standards must be raised so that all new infrastructure meets resilience criteria and supports the decoupling of development from fossil fuels. The benefits of this will be substantial. Instead of paying for disruptions and damage every time a disaster strikes, it is much cheaper to design roads, power plants, distribution lines, and water supply equipment taking climate change impacts into account from the outset. Other sustainability issues are also best addressed at the design stage, such as the impact on local communities, conflicts, and operating and dismantling costs.

For these reasons, climate change is one of the fundamental pillars of our Vision 2025 strategy, which aims to guide the region toward sustainable recovery.

Finance ministries supervise public spending. Documenting the cost that climate change imposes on public treasuries is key to informing public action. Today, many governments do not know how much they spend after floods and hurricanes, or how much they invest in actions consistent with the goals of the Paris Agreement. The use of green budget classifications or tags would help shed light on this issue. Measurement is a precondition for good management.

Finance ministries lead or help define the rules that regulate public procurement, and altering these standards has tremendous potential to address climate change. There is no shortage of potential applications, from ensuring that all public buildings are energy efficient and climate resilient to prioritizing electrical vehicles for public fleets and sourcing local, environmentally friendly food for schools.

Finance ministries establish taxes and subsidies. Price signals play a key role in directing private sector investments and operations. However, the region still spends about 1 percent of GDP on fossil fuel subsidies. Correcting prices requires implementing environmental taxes and reforming energy subsidies with a view to managing social impacts and helping energy-intensive businesses adapt. Public finances benefit from saving money while improving social outcomes and price incentives.

Finance ministries define fiscal strategy. Many countries in our region depend on royalties from the production

or export of fossil fuels to finance public spending. The global energy transition will erode that income base, however, and almost three trillion dollars of government revenue could be lost by 2035. Other countries depend on domestic consumption taxes on gasoline and diesel, which will also steadily disappear due to electromobility. There is time to act, but finance ministries must start planning today.

Finance ministries help to mobilize private resources. Governments cannot and should not finance the entire transition to a decarbonized and climate-resilient economy, but they can catalyze private investment by creating the necessary incentive frameworks and implementing regulatory reforms to help reduce barriers to private investment. They can also help to develop markets for new sources of financing such as green bonds, to take advantage of the growing interest in capital markets for financial products that contribute to a more sustainable world.

Lastly, finance ministries also play a central role in coordinating government action and international cooperation. Climate change is a complex issue for all sectors of government and for the private sector. Finance ministries, along with the ministries of planning and environment, must ensure that all sector development plans are aligned with climate goals. As privileged counterparts of the multilateral development banks, they can seek international assistance to design and implement climate change plans anchored in national development

priorities. These plans, developed with line ministries and other stakeholders, can serve to clarify the actions of finance ministries.

“Fiscal Policy and Climate Change” is the result of an unprecedented collaboration between the Inter-American Development Bank’s Fiscal Management and Climate Change Divisions. Together, they have systematically reviewed the ways that finance ministries can be part of the solution to the climate crisis. This innovative publication has mobilized the knowledge of more than 18 IDB sector specialists and a variety of experiences from finance and environment ministries in Latin America and the Caribbean that reflect valuable lessons that can be replicated and scaled up throughout our region.

Faced with the COVID-19 crisis and other challenges in the region, the IDB must be able to offer the countries of the region concrete, relevant measures. Our commitment is to help mainstream climate change in order to safeguard the development visions of our countries across all sectors of their economies. In response to a specific request from our governors, the IDB is developing a platform that will allow it to exchange experiences and evaluate the most relevant examples for our countries, including those that appear in this publication, those from other sectors, and those that we have not yet identified within this innovative agenda.

I am confident that this publication will help to advance the dialogue on the

role of finance ministries in offering solutions to the climate crisis, enhancing risk management, and generating new

opportunities for the prosperity of all Latin Americans.

BENIGNO LÓPEZ BENÍTEZ

VICE PRESIDENT FOR SECTORS AND KNOWLEDGE
Inter-American Development Bank

INTRODUCTION



Efforts to boost economic growth after the havoc caused by the COVID-19 pandemic offer the opportunity to invest in a better type of development—one that can substantially increase adaptive capacity in the face of the physical impacts of climate change while also supporting the move toward net zero carbon emissions. Fortunately, there is overwhelming evidence at the international level showing that proper planning for the transition to the green economy offers significant economic and development opportunities that will create more and better jobs. For example, a recent study by the Inter-American Development Bank (IDB) and the International Labor Organization highlights that the Latin American and Caribbean region could create 15 million net jobs by 2030 as part of a progressive transition to net zero emissions (Saget, Vogt-Schilb, and Luu, 2020).

To limit global warming to between 1.5°C and 2°C above pre-industrial levels, emissions need to be reduced substantially by 2030, with a goal of net zero emissions by 2050 (Masson-Delmotte

et al., 2018). However, international efforts to address climate change are still largely insufficient, creating significant risks for all economies and public finances.

Extreme weather events can lead to major human losses and significant economic damage while also placing substantial pressure on public finances. For example, it is estimated that at least one extreme weather event per year is associated with an increase in the fiscal deficit of 0.8 percent of gross domestic product (GDP) for lower middle-income countries in Latin America and the Caribbean and 0.9 percent of GDP for low-income countries.

At the same time, greater production of energy from renewable sources and the growing electrification of public and private transportation worldwide will reduce the demand for products from fossil fuel exporting countries in the region, with a potentially significant impact on fiscal revenue.

The countries in the region must make additional efforts to fully internalize these opportunities and challenges across all economic and government activities

from a public policy, planning, and financing standpoint. For example, the report “LEDSenLAC 2019” found that of 21 Latin American and Caribbean countries studied, only 2 had national mitigation strategies with a vision for 2050 (Calero et al., 2020) and only 4 others had financing strategies for the commitments adopted under the Paris Agreement.

The challenges managed by finance and planning ministries include three areas of intervention that can make an important contribution to ensuring that countries make the most of economic opportunities while minimizing risks to their economies and finances.

1) Economic and fiscal risks

- › **The transition:** The transition to economies with net zero emissions in Latin America and the Caribbean will disrupt sectors that have traditionally contributed to tax revenues, such as exports and fossil fuels. In particular, the global energy transition means that the finances of several countries will be affected by an inability to exploit some resources and physical assets, which may have to be devalued or retired before the end of their useful life cycles. Finance ministries need to anticipate the risks of lower revenues and plan for the transition by implementing alternative fiscal measures.
- › **Financial sector stability:** Climate change and a disorderly transition to the low-carbon economy may have a

systemic impact on both the financial sector and macroeconomic stability. Finance ministries in the region that act as supervisors and regulators of the financial sector should support the orderly internalization of climate risks in that sector’s operational decision making and balance sheets. For example, they can explicitly address climate-related risks through binding regulations or financial sector supervisory measures.

- › **Extreme climatic events:** The impact on infrastructure and populations is an added source of fiscal pressure. Public finances would benefit from mechanisms to diversify risks and create financial buffers, as well as from the introduction of broader governance and risk management mechanisms within finance ministry mandates. As part of these efforts, public investment systems need to be strengthened by incorporating elements of resilience and risk management into projects and programs. Clear government investment priorities will also help guide sustainable private sector investments.

2) Just transition

The transition process toward the green economy involves structural and technological changes and new patterns in the production and consumption of goods and services (Global Commission on the Economy and Climate, 2014).

Through proper fiscal management, public investment and spending, finance ministries play a central role in supporting transitions that address distributional impacts on the economic sectors and workers affected by these changes. Likewise, finance ministries can help to take advantage of new sources of employment and economic growth resulting from the adoption and development of new technologies and investments.

3) Access to financing

The resources needed to finance the transition far exceed the financial capacity of governments. Nonetheless, public policies and finances play a crucial role in catalyzing private investment in activities consistent with climate objectives: first, by establishing the necessary incentive frameworks, and second, by planning public investments and implementing regulatory reforms to help reduce barriers to private investment. In addition, finance ministries can support the development of new markets such as green bonds, taking advantage of the growing interest of capital markets in placing resources in sustainable projects and thereby accessing a new investor base.

The public policy and investment decisions that countries make today to reactivate their economies will determine whether they can meet their climate goals in 2025 and 2030. But it is even more important that they avoid being trapped in high-carbon pathways that

prevent them from meeting the goals of the Paris Agreement and achieving net zero emissions by 2050. Countries run the risk of being locked into investments that are inconsistent with a decarbonized world by the middle of the century, with the additional costs that stranded assets¹ will impose on economies and the public finances. Adequate fiscal planning and financial policies are essential for avoiding these costs and ensuring that public financing flows are consistent with green, inclusive economies: i.e., consistent with truly sustainable development.

Fortunately, finance and planning ministries in Latin America and the Caribbean have assumed increasing leadership in recent years through the development and implementation of different fiscal and planning policies that are having a positive impact on climate action. “Fiscal Policy and Climate Change” is an introductory document to the areas of competence of finance and planning ministries in climate change matters, highlighting the recent experiences of these ministries in the three areas listed above. These experiences will help to illustrate the tools that are being used, as well as others that are available. Likewise, the document seeks to provide inputs for decision making aimed at encouraging truly sustainable growth in the wake of the pandemic. “Fiscal Policy and Climate Change” provides a global, integrated vision of a set of climate issues

¹ Stranded assets are defined as carbon-intensive assets devalued or retired before the end of their expected useful life (Binsted et al., 2019).

of relevance to finance and planning ministries. However, some issues have only been covered in part. This is certainly the case with regard to carbon pricing, which has been addressed here through a review of fuel subsidies, given their potential impact on the goals of the Paris Agreement.

Climate change is a cross-cutting issue, so mitigation and adaptation actions require a multifaceted approach within the framework of the institutional and functional structures of finance ministries. With this in mind, this publication is divided into seven chapters.

The goal of Chapter 1 is to introduce the reader to the nature and value of long-term decarbonization strategies for planning the transition. The focus here is on the role that finance and planning ministries play in these strategies.

Chapter 2 focuses on the impact on fiscal sustainability of the risks posed by stranded assets and the increased frequency of extreme weather events. It also explores the options, challenges, and benefits of green fiscal reforms aimed at altering relative prices (particularly the streamlining of fossil fuel subsidies, taking into account the desirability of addressing distributional impacts).

Natural disaster risks are addressed once again in Chapter 3, this time from the perspective of best practices that finance ministries can implement to improve the governance and management of these events.

Chapter 4 discusses how proper, consistent identification of budget

spending on climate change can provide information to support improved decision making. Governments can evaluate how best to spend, taking advantage of the benefits of green public procurement and ensuring that public budgets are consistent with the objectives of the Paris Agreement.

Chapter 5 describes the types of policies needed to generate more sustainable public and private investment. Emphasis is placed on the need to develop long-term planning instruments, as well as reforms to national public investment systems that treat sustainability as a broader concept than environmental sustainability alone.

Chapter 6 considers the range of areas in which finance ministries intervene in regard to climate action, as described in earlier chapters. Specifically, it addresses how the development of climate change financial strategies can help to effectively coordinate national climate objectives with investment priorities, capital attraction, the availability of financial instruments, and the alignment of public and private financing.

Chapter 7 completes this publication by addressing economic recovery packages after the COVID-19 pandemic and the features that these should include to ensure consistency with international efforts to address climate change.

Chapter 1

Decarbonization Strategies and the Role of Finance and Planning Ministries

Section 1. Long-Term Decarbonization Strategies and Their Relationship to Fiscal Planning

MARCELA JARAMILLO

In signing the Paris Agreement in 2015, 196 countries agreed to reduce their greenhouse gas emissions to limit global warming to 1.5°C to 2°C above pre-industrial levels. They also agreed to increase their capacity to adapt to the adverse effects of climate change and improve their resilience to its impacts. These country commitments are referred to as nationally determined contributions (NDCs).

The commitments from the first round of NDCs are still insufficient to ensure that global trends toward reducing greenhouse gas emissions are compatible with the Paris Agreement target (United Nations Framework Convention on Climate Change, 2016). The NDCs are not static documents, however, and the Agreement requires countries to review their contributions every five years to “reflect the highest possible ambitions”. Likewise, pursuant to Article 4 of the Agreement, countries are expected to draw up long-term strategies (LTS) that will allow them to achieve decarbonization of their economies by the middle of the century.

LTS are instruments that support timely identification of the regulatory and public policy reforms and investment options that are needed for an orderly, just, and inclusive transition, as well as the order in which they should be implemented. From a fiscal perspective, governments must take on board the fact that achieving net zero emissions will require changes in all sectors of the economy, with direct and inescapable implications for fiscal policies and outcomes. Thus, finance and planning ministries can find value in being important participants in the development and implementation of LTS in their countries, using them as an additional tool for fiscal planning. Moreover,

these ministries can reaffirm their role as lead agencies for national planning systems in countries where they have this responsibility.

1.1 Functions of Long-Term Strategies

The key to the effectiveness of policies relating to countries' Sustainable Development Goals (SDGs) is that they be consistent with the decarbonization process required to achieve net zero emissions by 2050. Policy and investment decisions taken today will have a direct impact on the ability of countries to meet that long-term goal. Even if a country's actions in the short term lead to significant reductions in emissions, its efforts may still fall far short of reaching the 2050 target if they do not involve key sectors such as public transportation. These sectors are more difficult to decarbonize because low-carbon alternatives are more expensive or take longer to develop and deploy.

One might consider that improvements in the efficiency of private vehicles would be sufficient to reduce emissions from the transportation sector by 2025. However, a further reduction in emissions will be required by 2035 that can only be achieved through new large-scale public subway lines and a transition to private electric cars. Given that subway systems take decades to build, the investment and planning phases may need to begin before 2025, demonstrating how the goal of large emission reductions by 2035 affects the steps that governments need to take by 2025. If a government only focuses on the efficiency of internal combustion vehicles before 2025, then even if emissions are reduced without subway lines, the country's economy is at risk of being locked into carbon-intensive development pathways that will be unnecessarily expensive to break out of.

LTS can help governments plan the transition to net zero carbon emissions by 2050 and facilitate consensus building on the development goals required for decarbonization. As planning instruments, they can help anticipate and manage the possible trade-offs of the transition process by identifying the following issues:

- › The design of short-, medium-, and long-term regulatory and policy reforms.
- › The need to redirect infrastructure investments to avoid those that might create stranded assets, for example, or leave the country locked into high carbon emissions (see Chapter 2, Section 1), while at the same time making progress toward designing investment plans to support the transition.

- › The social impacts of decarbonization and of a just and inclusive transition,² anticipating changes in the labor market and identifying strategies to offset the impact of price reforms on consumers.

At the same time, a robust LTS should perform the following functions:

- › Define the country's vision of the expected development outcomes associated with the process of deep decarbonization of the economy, and identify the sector trajectories required to achieve this goal.
- › Report on the updating of existing and future NDCs (covering five-year cycles), so that they align with long-term decarbonization goals (IDB and Deep Decarbonization Pathways in Latin America [DDPLAC], 2019).
- › Include concrete sector objectives, with specific long-, medium-, and short-term goals that cover all the emitting sectors of the economy. For example, 85 percent of public transportation should be zero emissions by 2050, 30 percent of buses should be electric by 2035, and there should be a pilot project to test electric buses by 2021.
- › Include a roadmap for public, institutional, and investment policies that identifies the institutional and regulatory reforms and policy actions required to achieve the objectives. For example, continuing with the example of electric buses: update the regulations on bus concessions and publish electric bus fares for 2022; determine institutional arrangements for both cross-sector coordination and execution (the function of government ministries and agencies); and review the legal and political framework, existing planning instruments, and monitoring and progress reporting systems, among other things.
- › Identify investment priorities (those required and those to be avoided) and develop a roadmap for integrating decarbonization criteria into public investment decision-making processes.

2 The concept of just transition encompasses a goal and a process. The goal is to ensure that climate change and climate change policies do not exacerbate inequality. In other words, poor and marginalized people must be protected from the impact of climate change, and policies for decarbonization should not exacerbate inequality and poverty. The process consists of jointly building climate policy with all stakeholders, making use of social dialogue (International Labor Organization, 2015).

1.2 Parties Involved in Long-Term Strategies

Given the crosscutting nature of climate impacts and actions, it is essential for the effectiveness of an LTS that it be designed together with the sector ministries, private sector, and other stakeholders, as this allows their objectives, policy options, data, and doubts to be fully understood and incorporated. The LTS should also identify options that meet multiple development goals (including, but not limited to, attaining net zero emissions), while assessing the performance of sector measures to achieve carbon neutrality in terms of their costs and benefits for sectors, users, companies, and governments.

Finance ministries can play an important role in the design and implementation of LTS. The LTS design process is generally led by environment ministries or the institutions traditionally responsible for climate and environmental policy, which have technical knowledge on climate change. However, achieving net zero emissions and climate-resilient development requires transformations in all sectors of the economy and has direct implications for fiscal policy and outcomes, as well as investment options. Finance and planning ministries can perform the following functions:

- › Participate in the country's governance structure for designing the LTS and support the process of building consensus around objectives.
- › In areas of uncertainty or risk, or where development objectives can be advanced through decarbonization, participate in the LTS design process by providing input into national priority areas from a public finance perspective. The ministries may also share data or information that can be used as part of the analytical work for designing the LTS, as well as highlighting important issues that should be included to inform public policy and decision making.
- › During the consultation process of the design phase, make use of their convening power to support the ministries responsible for LTS development.

The LTS implementation phase requires a broad effort to coordinate across sectors. International experience suggests that more centralized offices, such as those of the presidency, can help coordinate sector ministries and other state agencies in implementing the LTS (Elliott et al., 2019). Consequently, ministries of finance, planning, and economic policy, which often act as the lead agencies for national planning systems, should play a central role in governance arrangements for the implementation and integration of LTS objectives into planning instruments. Many countries already have this type of structure to coordinate strategies and development plans and even the SDGs.

Before using an LTS to plan policy reforms, public investment, and financing strategies, governments should have a vision of the gradual sector transformations needed to meet decarbonization and development goals. If the required sector transformations are unclear, the conversation surrounding policy and financing is irrelevant. These reforms and strategies will promote the mobilization of multiple sources of investment necessary to achieve the transition, including the identification of mechanisms to expand the participation of private investment.



Most of the investments required for decarbonization will be the responsibility of the private sector. However, market organization can be an obstacle, raising the need for reforms and regulations.

1.3 Policy and Regulatory Reform, Public and Private Investment, and Financing

Most of the investments required for decarbonization will be the responsibility of the private sector. However, current market organization can be an obstacle to decarbonization, opening up the need to reform policies and regulations to facilitate the transition (IDB and DDPLAC, 2019). For example, the progressive adoption of electric cars or deployment of energy efficient buildings for residential, commercial, and office purposes will fall primarily on the private sector. In these cases, building codes and efficiency standards for electric engines and equipment, respectively, will play a central role in facilitating the transition. In some Latin American and Caribbean countries, the private sector also provides services such as power generation, public transportation, or waste management.

Likewise, the implementation of LTS will require a reallocation of public investment. Many of the investments needed to implement LTS will be the responsibility of the public sector. In Ecuador, for example, most power is generated by public utilities, which in the framework of an LTS may translate into a plan to expand public energy. In another example, Costa Rica's transportation sector plays a key role in emissions, and the National Decarbonization Plan contains an investment schedule for the 2019–22 period that includes the creation of exclusive bus lanes, the construction of intermodal public transport stations, and the launch of a railway project (IDB and DDPLAC, 2019).

Given the fiscal constraints faced by governments in Latin America and the Caribbean, it is essential, if net-zero emissions development goals are to be achieved,

that national planning and financing instruments translate into efficient and targeted use of public resources. It will also be important to create environments that encourage private investment consistent with these objectives and increase effective access to international climate financial resources. The areas that may require attention from ministries of finance and economic planning are tax policy, subsidies and incentives, public investment planning, monitoring of public spending efficiency and effectiveness, coordination of cross-sector progress, and the leveraging of international sources of climate finance (Box 1).

Box 1. National Decarbonization Plan 2018–50 and the Role of Costa Rica’s Ministry of Finance, National Planning, and Economic Policy

In 2019, President Carlos Alvarado announced Costa Rica’s 2018–50 National Decarbonization Plan. This projects a comprehensive transition to net zero emissions by 2050, with a policy roadmap and phased-in targets in all sectors (Gobierno de Costa Rica, 2019).

The plan contains short- (2018–22), medium- (2023–30), and long-term (2031–50) objectives for different sectors. The objectives for the transportation sector are for 85 percent of public transportation to be operating with zero-emission technologies by 2050, 30 percent of public buses to be electric, and construction of an electric train system by 2035. In the energy sector, electricity generation must maintain its current zero level of emissions. In the construction sector, the use of wood, bamboo, and other local materials in buildings will increase by 10 percent by 2025. In the sanitation sector, 100 percent wastewater treatment must be achieved by 2040, and in the livestock sector, 60 percent of areas dedicated to livestock will adopt low-carbon practices. More than 50 policy actions have been identified that must be implemented by 2022 in order to effectively put the country on track to achieve the plan’s objectives.

The plan also identifies actions to be avoided that go against the objectives of decarbonizing the economy. An example is the transportation sector, where transitional technologies will be excluded if they nominally reduce emissions in the short term but create barriers to full decarbonization in the medium and long term.

Design of the plan was a consensus-based process led by the Presidency and the Ministry of Environment and Energy, with strong support from the Ministry of National Planning and Economic Policy (MIDEPLAN). MIDEPLAN’s participation was key for generating consensus and affirming the plan’s political viability. These institutions carried out a far-reaching joint design process reflecting the visions of different sectors.

The Ministry of Finance and MIDEPLAN work in seven relevant areas in which their actions are essential for the plan:

1) Fiscal sustainability: Approximately 10 percent of Costa Rica's fiscal revenues are linked to fossil fuels. Without fiscal adjustments, the decarbonization of transportation would have a moderate fiscal impact of approximately 0.4 percent of GDP, occurring mainly after 2035. This would be less than the financial benefits of decarbonization, which total 1.5 percent of GDP. Marginal fiscal adjustments in energy, property, and import taxes would offset the fiscal impact while also ensuring that companies in the sector (buses, taxis, light and heavy cargo) and households of different income levels and regions of the country benefit from decarbonization (Rodríguez Zúñiga et al., 2021).

2) Investment planning: Effective plan implementation not only requires identifying an immediate flow of investments, but also the greater transformations that are required to align public and private finances behind net zero emissions development and resilience to climate change. In response, the plan seeks to clarify the costs and benefits of its implementation, the impact on the labor market, and best practices to ensure a just transition.

In the cost-benefit analysis, the government considers benefits beyond reductions in emissions. In the transportation sector, for example, decarbonization will bring net benefits of US\$19 billion by 2050 as a result of lower operating costs, time saved in traffic, reduced health impacts, and fewer accidents (Groves et al., 2020). All of this far offsets the cost of electric vehicles in the initial stages.

The analysis also includes a granular exercise relating to the investment plan, aimed at identifying the type and scale of investments linked to each of the objectives and activities listed in the plan. In addition, the plan identifies both the knowledge and the institutional policies, processes, and tools necessary to execute these investments in the short, medium and long term. These two exercises will help identify financial gaps and possible approaches to stimulating public and private investment, as well as ways of making better use of international financing. They will also generate inputs to inform national and sector policy makers and investment planning, as described below.

3) Integration of plan objectives into the public investment prioritization process: Implementation of the plan will require public and private investments. To ensure the coherence of investment plans and projects across sectors, it is crucial to integrate decarbonization considerations into the public investment prioritization process (Organisation for Economic Co-operation and Development [OECD], 2017). This can also provide clear signals to the markets regarding the government's priorities. Integration of the plan's objectives involves establishing direct links with national and sector development plans, as well as the use of systematized criteria in decision-making processes to align public investment choices.

Decarbonization is included among the priority variables for national development in Costa Rica's National Development Plan. The Decarbonization Plan also serves as the starting point for MIDEPLAN's Costa Rica 2050 Strategic Plan ("Toward Sustainable and Inclusive Development"), which will incorporate the objectives of the Decarbonization Plan into the country's economic development model. Using the Decarbonization Plan as a key input, MIDEPLAN is currently assessing productive opportunities and public investment priorities that will help the country to modernize its economy, create jobs, reduce poverty, and boost growth in a decarbonized future.

MIDEPLAN is also working to develop tools to systematically align public investment projects with the sector objectives set out in the Decarbonization Plan. In addition, it is working on guidelines and tools for prioritizing projects that are registered under the National Public Investment System and are aligned with the plan. This will help ministries and government agencies in charge of implementing public investments to align sector planning and justify how the projects they execute within National Investment Systems are aligned with the country's decarbonization objectives.

4) Alignment of sector strategies and human resource endowments: One way to redirect public investment is to align sector investment plans with the LTS. In Costa Rica, the Decarbonization Plan was drawn up by the Ministry of Environment and Energy, but it assigned responsibilities to most of the other ministries. The government subsequently launched national energy and electric transportation plans, among others, and these reiterate decarbonization goals and associated sector objectives (IDB and DDPLAC, 2019).

There are often disparities in the ability of ministries to incorporate decarbonization targets into their plans and activities. Other challenges relate to a lack of clarity in ministry functions and limited human resources in some areas. In order to facilitate implementation of the Decarbonization Plan, for example, the institutional capacity of the Ministry of Public Works and Transportation needs to be strengthened to enhance capabilities in the area of electromobility. The Ministry of Environment and Energy also needs to be reorganized so that it can carry out its new functions. These changes are part of a comprehensive institutional reform process to modernize the State's ability to respond to national development objectives. The process is led by MIDEPLAN in coordination with the Ministry of Finance, which sets the budgets for the different ministries and public agencies.

5) Monitoring and evaluation of the effectiveness and efficiency of public spending in relation to established goals: A lack of information regarding the level of public spending that is actually channeled or contributes to decarbonization efforts limits the government's ability to evaluate the effectiveness and efficiency of public spending in this area. The international recommendation is to develop mechanisms for the continuous monitoring of climate spending, allowing countries to report on the commitments assumed under the Paris Agreement (UNFCCC, 2018). Several countries in Latin America and the Caribbean have completed exercises to identify and/or evaluate climate spending (see Chapter 4). This experience has reinforced the need to define uniform criteria for climate activities and systems that allow continuous monitoring of spending (United Nations Development Programme (UNDP, 2018).

In response, the Ministry of Finance is developing a budget tagging system to track central government spending on climate change and biodiversity, as well as guidelines and procedures for the use of these tags by government entities. This will improve transparency and decision making in budget allocations to maximize the impact of public spending beyond the Decarbonization Plan. The effort may also facilitate the consolidation of different efforts by MIDEPLAN and the Ministry of Environment and Energy to identify and classify climate change-related finance, including funding provided by international donors and development institutions.

6) Governance for implementation: Coordinating the implementation of policy reforms and the necessary investment may require changes in institutional structures. The measures included in the Decarbonization Plan require cross-sector coordination as they involve 35 ministries and government agencies, connect multiple sectors, and require the participation of the private sector, academia, and civil society. Several actions established in the plan will require cross-sector coordination in areas that frequently formulate and implement their programs in isolation.

Consequently, the Decarbonization Plan provides for a team to be created in the Office of the President, operating in coordination with MIDEPLAN, the Ministry of Finance, and the Ministry of Environment and Energy. The team's responsibilities are to review, align, and prioritize public development processes. They must also provide supplementary guidance to government entities that need to incorporate decarbonization objectives into the different sectors, thus accelerating implementation of the plan's key actions and ensuring effective monitoring and coordination.

7) Mobilization of financing (including international finance): The Ministry of Finance is responsible for coordinating international finance and maintains a dialogue with multilateral and bilateral entities aimed at identifying work priorities. In this respect, the plan serves as a natural framework for channeling support. In particular, the short-term policy actions determined under the plan formed the basis for policy-based loans from the IDB (2020a), the French Development Agency (AFD), and the World Bank. Furthermore, the plan establishes a list of priority issues for which the government is requesting support, thus allowing the Ministry of Finance and the rest of the government to coordinate technical assistance from international donors. This, in turn, increases the effectiveness of access to international sources of climate financing.

Chapter 2

Fiscal Impact of Decarbonization and Climate Change

Managing the impact of climate change on the public finances and fiscal sustainability is one of the most significant challenges for Latin American and Caribbean countries in the coming decades.

Firstly, the region is faced with the global transition toward the low-carbon economy, which will have profound impacts on global demand for hydrocarbons due to compliance with the goals of the Paris Agreement and the emergence and development of clean energy technologies. Secondly, the increase in global temperature and its effects on the frequency and intensity of natural disasters increase the risk that the region will need to deal with the negative consequences of catastrophic events more regularly.

From a public policy perspective, uncertainty about future oil and gas demand entails significant macroeconomic and fiscal risks, as many countries depend on resources generated by the production and export of hydrocarbons. Consequently, countries should identify and manage the risks of stranded assets in their hydrocarbon industries, as is explained in Section 1 below. Likewise, the commitments made in the Paris Agreement to reduce greenhouse gas emissions have implications for the hydrocarbon subsidy policies currently in force in many Latin American countries. In this sense, and as discussed in Section 2, the implementation of green fiscal policies—including the elimination of subsidies and the use of instruments such as carbon taxes—will be vital for advancing the region’s decarbonization agenda. Lastly, Section 3 addresses the fiscal consequences of extreme weather events, which have been increasing in the region in recent decades. In particular, these events have a significant impact on countries’ budget balances, as they tend to decrease fiscal revenues and increase public spending. To improve its management of this risk, the region therefore needs to strengthen its strategies and fiscal instruments.

Section 1. Stranded Asset Risk and Associated Fiscal Impacts

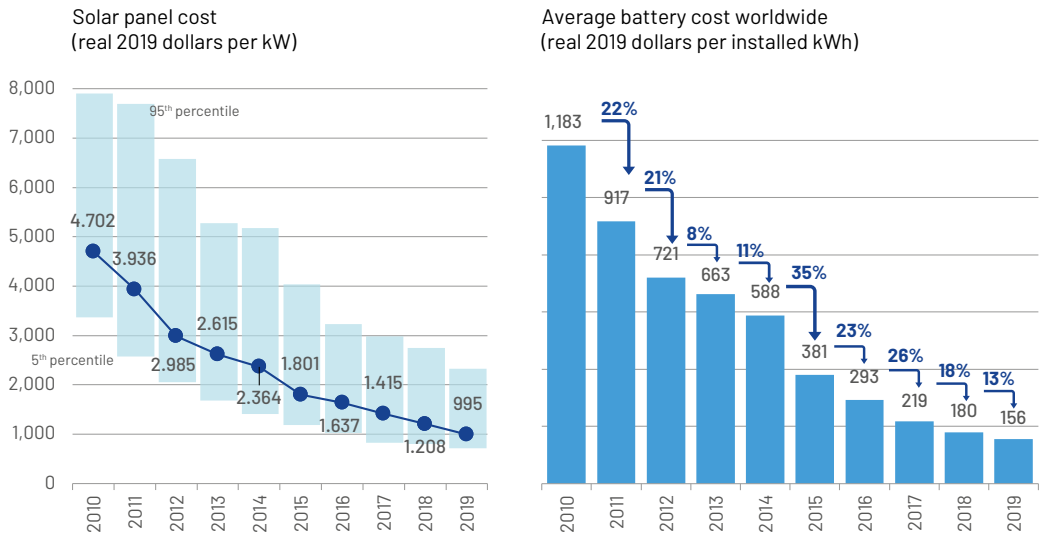
ADRIEN VOGT-SCHILB

Numerous Latin America and Caribbean countries depend on world oil demand for fiscal revenue, since almost half of what is produced in the region is exported (BP, 2017). During the 2013–18 period, on average 8.3 percent of public revenues in Bolivia, 8.0 percent in Ecuador, 6.6 percent in Trinidad and Tobago, 5.4 percent in Mexico, and 2.5 percent in Colombia depended on the exploitation of oil and natural gas (OECD et al., 2020). In the Bolivarian Republic of Venezuela, oil represented 98 percent of export earnings in 2017 (Organization of the Petroleum Exporting Countries, 2017). Looking ahead, countries such as Argentina, Brazil, and Mexico have ambitious plans to increase their production, and others, such as Guyana, are set to begin exploitation on a transformative scale for their economy (International Energy Agency [IEA], 2017). Despite the region being a significant player, its position in the world oil market is far from dominant: it has a fifth of the world's proven reserves and produces just under 10 million barrels per day (10 percent of world oil demand) (BP, 2017).

A recent United Nations study shows that the aspirations of world producers for oil, gas, and coal production are inconsistent with international climate goals, as by 2030 they would collectively generate more than twice as much carbon dioxide as would be consistent with the 1.5°C target (Stockholm Environment Institute et al., 2019). In fact, a growing risk for oil-exporting countries is that future demand is highly uncertain. As alternative technologies become cheaper (Figure 1) and measures are launched to address climate change and implement the Paris Agreement, demand for oil is expected to drop sharply (IEA, 2019a; Carbon Tracker Initiative, 2018). Electricity generation is also expected to come increasingly from renewable sources, while electromobility and the electrification of energy use will drastically reduce demand for hydrocarbons (Audoly et al., 2018; IDB and DDPLAC, 2019; Davis et al., 2018; Rogelj et al., 2018).

These changes are already occurring. According to the International Renewable Energy Agency (IRENA) and the IEA, renewable energy is already cheaper than fossil energy for most new uses in the world, and three-fourths of all new electricity generation capacity in the world is renewable (IRENA, 2020). Many countries are increasing the sale of electric vehicles while proposing a ban on the sale of diesel and gasoline vehicles in the relatively near future (IEA, 2018).

Figure 1. Decrease in Battery and Renewable Energy Costs Between 2010 and 2019



Note: The figure on the left represents the average cost of new photovoltaic power generation capacity worldwide in 2010–19, in U.S. dollars per installed kilowatt (IRENA, 2020). The figure on the right represents the average battery cost worldwide in 2010–19, in US dollars per installed kilowatt hour (Bloomberg NEF, 2020).

If global climate action continues, the demand for oil will decline dramatically. This will lead to fossil fuel reserves that cannot be extracted or used (“unburnable carbon”) if the world sticks to a determined carbon budget (Carbon Tracker Initiative, 2011; Leaton, 2015). These reserves are an example of a stranded asset.

In addition to stranded assets, the concept of committed carbon emissions is also useful. This is used to assess the impact of energy infrastructure on climate change over its expected life (Davis and Socolow, 2014). Fossil fuel power plants typically have a 30- to 40-year life span, and committed emissions are the carbon emissions that will be generated by the normal operations of current fossil fuel power plants during that time. The world’s existing fossil fuel energy infrastructure will emit 30 percent more CO₂ over its lifetime, which would be inconsistent with the 1.5°C target (Tong et al., 2019).

According to data compiled by the Intergovernmental Panel on Climate Change, the committed emissions of current power plants in Latin America and the Caribbean are also 30 percent higher than average carbon emissions from the electricity sector, which likewise are inconsistent with the 1.5°C target (González-Mahecha et al., 2019). If all the planned and announced fossil fuel power plants in the region were built (most of which are natural gas power plants), the situation would worsen, causing committed emissions to exceed the established limit by 150 percent. The concept of committed emissions also applies to fossil fuel reserves.

The only way to reduce committed emissions is to replace part of the installed capital with new low-emission facilities (or in the case of fossil fuel reserves, keep them in the ground so they are not used). Doing so quickly, however, would mean removing physical assets and equipment before the end of their planned lives, turning them into stranded assets. This represents significant costs to the owners of the assets and would potentially affect the workers associated with them (Box 2).

Some policy instruments can precipitate the emergence of stranded assets (Rozenberg, Vogt-Schilb, and Hallegatte, 2020). For example, the unexpected introduction of a carbon price or elimination of diesel subsidies imposes a new cost on taxis and bus companies, reducing their future revenues and therefore the current value of their business. A carbon price can make existing power plants uncompetitive and force them to shut down. The government can also create stranded assets directly by prohibiting the use of some technologies. Lastly, technological change can also lead to stranded assets: for example, if new renewable power plants undermine the competitiveness of old coal, diesel, or natural gas plants.

In addition to the direct impact of stranded assets on owners, the sudden devaluation of a large number of financial assets could create instability in financial markets depending on levels of exposure, which in turn could create macroeconomic instabilities (Frisari et al., 2019). Stranded assets could also create political instability due to a rapid loss of wealth among the owners of affected capital assets and could lead to lobbying actions that run counter to the objectives of the Paris Agreement (Rozenberg, Vogt-Schilb, and Hallegatte, 2020).

Box 2. Challenges of the Closure Plan for Coal-Fired Power Plants in Chile

In June 2019, the President of Chile, Sebastián Piñera, presented a plan aimed at boosting the generation of renewable energy and reducing greenhouse emissions by closing coal-fired power plants (Presidencia de Chile, 2019). The plan shows that future emissions from energy infrastructure can be avoided, but that the negative social effects of such an initiative need to be addressed, including job losses. The Chilean government has considered options for gradually phasing out coal-fired power generation plants between 2030 and 2050, before the end of their expected useful life. An IDB study shows that replacing coal with renewable energy would lead to the net creation of 2,000 to 8,000 jobs by 2030 (Vogt-Schilb and Feng, 2019). However, the net positive impact on jobs hides the overall negative effects on the coal-based energy sector (losses of between 400 and 4,000 jobs by 2030). Although these figures are insignificant when compared with those of the Chilean labor market as a whole (which can create 40,000 jobs per quarter according to the National Statistics Institute (Instituto Nacional de Estadísticas, 2018), they are significant compared with the current number of direct and indirect jobs in power generation (48,000 in 2017).

The example of Chile reveals two key difficulties in managing the effects of stranded assets on employment, which are further explored in a joint report by the IDB and the International Labour Organization (Saget et al., 2020). One problem is that communities where coal-fired power plants currently operate may be severely affected by decarbonization. In the most exposed communities, coal-fired plants represent almost 4 percent of local GDP and 7.1 percent of local employment (Viteri Andrade, 2019). The other problem is that coal-fired power plant jobs tend to pay above-average wages and offer many social benefits (e.g., health insurance or retirement benefits). Even if more jobs are created in the renewable energy sector, there is no guarantee that these jobs will be located in the same communities. Coal-fired power plant workers employed by large energy generators in Chile can benefit from agreements with their employers allowing them to keep their jobs and transition to other power plants in the country. This may be the case more generally for fossil fuel industry workers employed by companies that diversify into renewable energy production. At the regional level, however, if the negative effects of the transition are to be avoided, alternatives may need to be offered that translate into better working conditions in the affected communities.

1.1 Quantifying the Risks of Stranded Assets for Latin America and the Caribbean

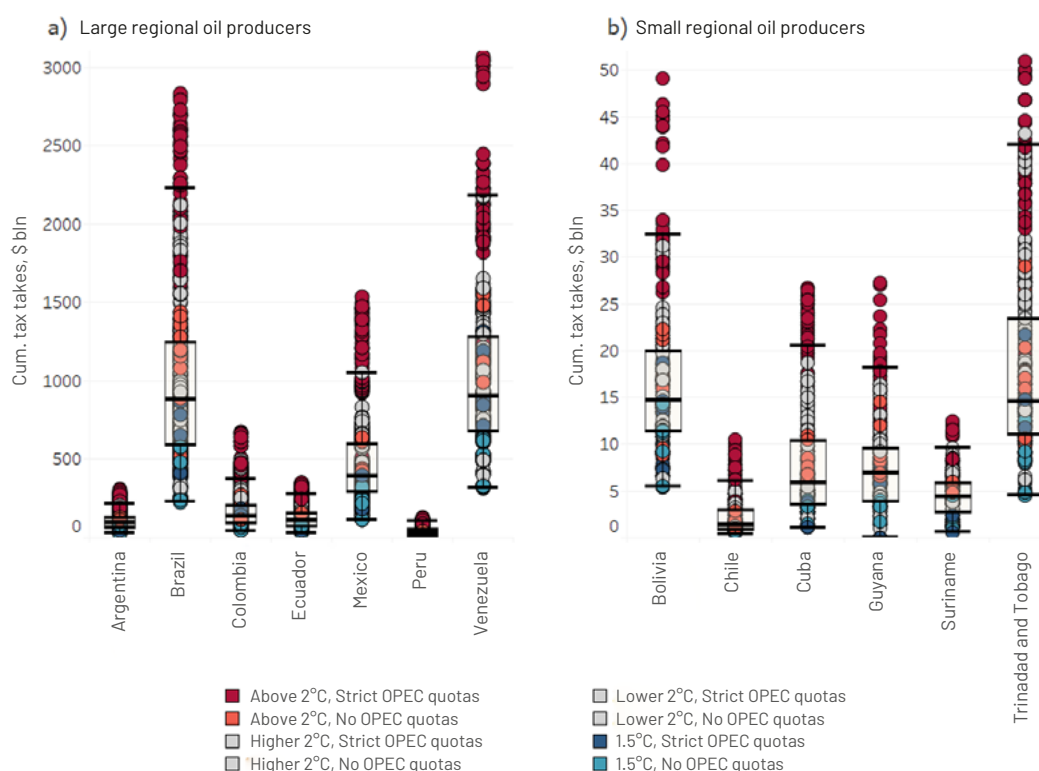
McGlade and Ekins (2015) analyzed the risks of stranded assets in fossil fuel reserves in 2050 if the global economy were to remain on track to limit temperature increases to 2°C. They estimated that a total of 39 percent of oil reserves would remain unburned, along with 53 percent of natural gas reserves and 51 percent of coal reserves.

Solano-Rodríguez et al. (2019) go further and analyze the implications of the energy transition for oil production, public revenues, and oil reserves in each exporting country in Latin America and the Caribbean. The authors use hundreds of global energy transition scenarios to explore the effects of the climate and production policies of large oil exporters on demand for oil from the region, associated public revenues, and unused reserves. The first finding is that in scenarios consistent with the goal of avoiding global warming of more than 1.5°C, Latin American oil production needs to fall to less than 4 million barrels per day by 2035—60 percent less than its pre-COVID-19 pandemic levels.

The two most important implications of this are, firstly, that 66 percent to 81 percent of proven, probable, and possible reserves in Latin America and the Caribbean will not be used before 2035. Secondly, fiscal and non-fiscal oil revenues will be US\$1.3 trillion to US\$2.6 trillion lower in the event of strong global climate action, compared with a total of US\$2.7 trillion to US\$6.8 trillion if global demand were high enough for reserves to be more fully exploited (Figure 2).

The range of expected revenues is wide and depends on factors outside the control of Latin American governments: world oil demand and the production decisions of the members of the Organization of the Petroleum Exporting Countries, which compete with oil from the region. For example, the interquartile range of tax collection for Brazil is between US\$550 billion and US\$1,250 billion. Scenarios below the interquartile range correspond mainly to cases where global oil demand is consistent with energy scenarios leading to global warming of 1.5°C (blue data points in Figure 2). These scenarios represent the greatest risk for oil producers. Variability within the groups arises from simulations that explore different strategies the region's countries could adopt to make their oil more competitive. Figure 2 shows that although such decisions may have an impact, they are less significant than exogenous decisions (global climate ambitions and decisions made by other oil producers).

Figure 2. Simulated Tax Revenue for Selected Latin American and Caribbean Countries Based on International Climate Goals and the Decisions of OPEC Producers, 2016–35



Source: Solano-Rodríguez et al. (2019).

Note: Each data point represents one of the 480 scenarios. The box and whisker plot shows the median and the interquartile range. Whiskers extend to 1.5 times the interquartile range.

1.2 Confronting Uncertainty through Fiscal Risk Analysis and Mitigation

These estimates illustrate the importance for Latin American and Caribbean governments of having a policy to identify and manage fiscal risks associated with the energy transition. Such a policy will need to take into account significant uncertainty about future levels of oil, natural gas, and coal production as progress is made toward meeting the Paris Agreement targets. Latin American governments cannot control the evolution of technology and the level of ambition of global climate policies, but they are exposed to their consequences in terms of demand for their hydrocarbons.

The recent example of coal in South Africa illustrates how countries in Latin America and the Caribbean could move forward with the support of development banks (Huxham, Anwar, and Nelson, 2019). The French Development Agency (AFD) and the South African Development Bank carried out an assessment of risk in that country based on three factors:

- 1 **Risk levels associated with significant falls in oil, coal, and natural gas prices:** Economies with greater dependence on the production and export of hydrocarbons will automatically be more exposed, as will economies where hydrocarbons are more expensive to extract, process, and transport.
- 2 **Financial risk distribution:** Depending on regulatory frameworks and the wording of contracts, financial risk is shared between the private sector (across value chains, e.g., between extractors, refineries, distributors, and consumers) and the public sector (at various government levels [e.g., municipal or central] or even at the specific program level [e.g., if social programs are financed by royalties on hydrocarbons]). In some cases, the distribution of risk is not explicitly covered in existing contracts.
- 3 **Investments that can increase the country's exposure to the risk of stranded assets:** The list includes mines, wells, and oil and gas pipelines, as well as railways, roads, and ports intended for the export of hydrocarbons.

Based on an assessment of the risks, the government can design strategies to reduce the latter. The South African case suggests the following possible approaches:

- › Avoid or delay investments that could increase the country's exposure to the risk of stranded assets, such as natural gas plants or low-profitability oil wells.

- › Plan a progressive withdrawal from economic activities most exposed to the energy transition.

It is important to maintain a balanced timetable. Closing fuel production assets too quickly can increase the country's energy bill, reduce the government's ability to fund programs (including social programs), and significantly affect workers and communities (Saget et al., 2020). In contrast, a plan that is too slow—with excessive investments in additional infrastructure and overly optimistic assumptions regarding future hydrocarbon exports—would lead to a more abrupt transition with more bankruptcies, higher debt, and defaults when expected export demand is not met (Binsted et al., 2019).

A risk management strategy is incomplete if it does not include mechanisms for transferring and sharing residual risks. This can be done in a number of ways (Huxham, Anwar, and Nelson, 2019), for example:

- › Make risk sharing explicit in order to reduce unmanaged risks and improve risk management efficiency.
- › Distribute risks among different levels of government, including subnational governments, to enhance management capacity.
- › Create funds with hydrocarbon-related revenues so as to mitigate risk over time and finance compensation packages for affected communities and workers.

A robust approach should entail gradually reducing the dependence of government budgets on hydrocarbon revenues and accelerating the diversification of the economy—particularly for countries where the importance of oil has increased in recent years, such as Bolivia, Colombia, and Ecuador. As governments design long-term emission reduction strategies consistent with the Paris Agreement and undertake investments in infrastructure and the broader economy to support the post-COVID-19 pandemic recovery, future oil demand and the prospects for domestic production will need to be considered as a crucial part of a robust policy decision-making process (see Chapter 7 on economic recovery after the COVID-19 pandemic and decarbonization).

Section 2. Review of Fossil Fuel Subsidies and Green Fiscal Reforms

ADRIEN VOGT-SCHILB

The price system can be an obstacle to adopting solutions that allow the private sector to transition to net zero emissions. In particular, low fossil energy prices can be a significant hurdle to the adoption of electric vehicles, renewable energy, and energy efficiency measures by households and businesses.

Eliminating or reforming energy subsidies would provide an incentive for economic agents to decarbonize. Energy prices in the region are kept artificially low by government subsidies. According to the International Monetary Fund (IMF), the region spent US\$44 billion on energy subsidies in 2017 (direct subsidies plus the cost of consumption tax exemptions). On average, governments in the region spend 1 percent of GDP subsidizing energy consumption. Reforming subsidies and targeting them toward the poorest households is a way of improving public finances while making the allocation of economic incentives transparent (Izquierdo, Pessino, and Vuletin, 2018).

In addition to subsidy reform, economic theory suggests that governments should use environmental taxes to discourage economic activities that impose costs on the rest of the economy (Pigato, 2018). For example, the use of diesel in cities pollutes the air and causes diseases and premature death, which has a human and economic cost. The IMF evaluated the health costs caused by energy use in each country, together with the costs of accidents, time wasted in traffic, and road wear caused by the use of vehicles. They concluded that the introduction of taxes to internalize the externality costs of fossil fuels would generate US\$111 billion per year in the region (Coady et al., 2019).

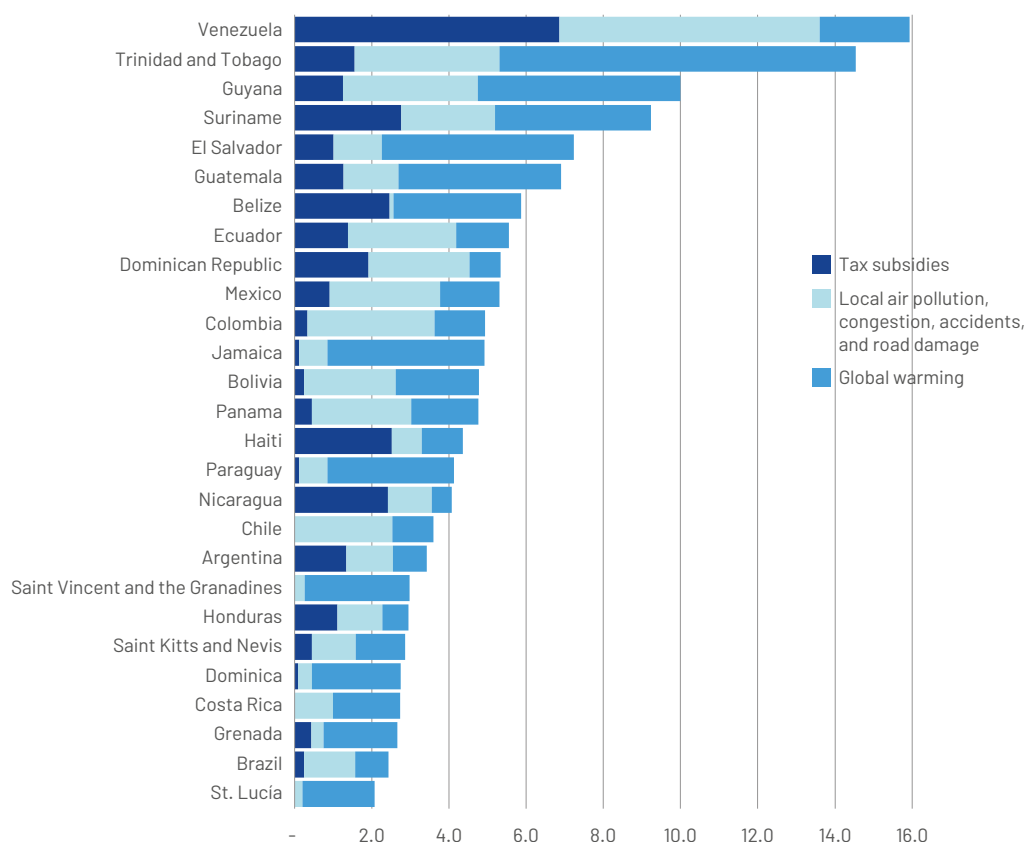
On the other hand, although a carbon tax is not a sufficient or necessary condition to decarbonize economies, it can help to advance this agenda (IDB and DDPLAC, 2019). A carbon tax is a tariff imposed on fossil fuels and other products based on the amount of greenhouse gases they emit (IMF, 2019b; Tax Policy Center, 2020; World Resources Institute, 2008). The High-Level Commission on Carbon Prices³ recommends that all countries apply a carbon price of at least US\$40 to US\$80 per ton of CO₂ by 2020 and US\$50 to US\$100 per ton of CO₂ by 2030, in conjunction with a series of sector

3 In 2016, to help spur successful implementation of the Paris Agreement, Joseph Stiglitz (Nobel Laureate in Economics) and Lord Nicholas Stern—at the invitation of the Co-Chairs of the Carbon Pricing Leadership Coalition (CPLC) High Level Assembly, Ségolène Royal and Feike Sijbesma—agreed during the 22nd Conference of the Parties of the United Nations Framework Convention on Climate Change (held in Marrakech, Morocco) to chair a new High-Level Commission on Carbon Prices comprising economists and climate change and energy specialists from all over the world, (High-Level Commission on Carbon Prices, 2017).

policies to facilitate compliance with the objectives of the Paris Agreement (High-Level Commission on Carbon Prices, 2017). According to the IMF, with a tax of US\$40 per ton of CO₂ on fossil fuels, the countries of the region could raise US\$69 billion per year (Coady et al., 2019).

Savings from the elimination of energy subsidies, the imposition of taxes to correct local externalities, and a conservative carbon tax could yield a combined US\$224 billion per year for the region. According to the IMF figures compiled in Figure 3, these savings would add up to more than 2 percent of GDP in 27 countries, and more than 10 percent in Guyana, the Bolivarian Republic of Venezuela, and Trinidad and Tobago.

Figure 3. Simulated Revenue from Energy Subsidy Reforms and Environmental and Carbon Taxes Yielding 2 Percent of GDP or more in 27 Latin American and Caribbean Countries



Source: Author's calculations based on Coady et al. (2019).

2.1 Options, Challenges, and Benefits of Green Fiscal Reforms

These environmental taxes and reduced energy subsidies have the added potential to reduce informality, tax evasion, and corruption (Bento, Jacobsen, and Liu, 2018; Liu, 2013). Combined with a reduction in traditional, less efficient taxes, an “upstream” fossil fuel tax (levied, for example, at the time of production rather than at final sale) could improve tax efficiency and revenue while being easier to implement and monitor. For example, a country may have tens of millions of businesses and households but fewer than 20 refineries and ports importing gasoline. Taxing gasoline at these points is easy, making evasion and corruption more difficult.

Despite these benefits, it has been difficult in practice to apply environmental taxes and implement energy subsidy reforms. One reason is their negative effect on the cost of energy, food, and public transportation, which affects poor and vulnerable consumers (Feng, 2018; Vogt-Schilb et al., 2019). The price increases associated with environmental fiscal reforms or reductions in subsidies could lead to social unrest if not well planned and managed. In Chile, rising public transportation prices triggered a series of protests in 2019 and months later gasoline subsidies were removed. In Ecuador, reductions in diesel subsidies sparked protests from workers in the transportation sector that led to reinstatement of the subsidies. Subsequently, the government began working toward a second attempt at reform, accompanied by a social assistance program for those most in need (Funke and Merrill, 2019; Schaffitzel, 2020).

At the international level, social discontent is common when governments suddenly implement price reforms without prior, participatory consultations and/or without proposing compensation measures for the most affected households and companies. Anticipating the effect of price increases on consumers and compensating affected households improves the political feasibility of reforms and allows them to be aligned with broader development goals (Fay et al., 2015; IMF, 2013; Rentschler and Bazilian, 2017; Whitley et al., 2018; Izquierdo, Pessino, and Vuletin, 2018).

Expanding and improving existing cash transfer programs can be a way to compensate consumers affected by subsidy reforms or environmental taxes, provided that fiscal costs and social benefits are properly assessed. Most countries in the region have cash transfer programs (Ibarrán et al., 2017), which are much more cost-effective than energy subsidies for distributing income to the population. In Latin America and the Caribbean, governments spend on average US\$12 on energy subsidies to transfer US\$1 of real income to households in the poorest quintile, compared to just US\$2 on cash transfers (Feng et al., 2018; Robles, Rubio, and Stampini, 2019).

Although the cost of cash transfer programs is lower, they are far from perfect. A significant fiscal problem is that they may encourage informality if they are effectively conditional on not having a formal job (Alaimo, 2018). Additionally, once implemented they

can become permanent, representing a recurrent fiscal cost year after year. They provide multiple social benefits (Bastagli et al., 2016) but do not always cover marginalized populations and households that do not meet their requirements (in contrast to the benefits of low energy prices, which reach a large number of households). In addition, their targeting is imperfect and they reach some households that are not poor, thus increasing their cost.

The impact on households is just one of several challenges facing energy price reform. Other sector issues that must be considered to ensure successful reforms include the efficiency of energy companies, the impact on energy-intensive businesses (including buses and taxis), and the incentives to adopt modern energy sources to replace traditional biomass. In addition, rather than raising prices overnight, the phasing-in of reforms facilitates adaptation and improves the likelihood that price reforms will be successful (Coady and Parry, 2018; Rentschler and Bazilian, 2017; Whitley et al., 2018).

Whatever the compensation measures for households and businesses affected by a government's environmental fiscal reforms, international experience shows that for the reforms to be accepted by society and for complementary policies to be relevant and fair, governments should design them with stakeholders to the extent possible. This includes trade unions, consumer groups, professional associations, employers' organizations, and environmental organizations (Saget et al., 2020). The long-term decarbonization strategies envisaged in the Paris Agreement (addressed in Chapter 1) are an opportunity for governments in general, and finance and planning ministries in particular, to convene such consultations.



Environmental taxes and reductions in energy subsidies have the potential to reduce informality, tax evasion, and corruption.

Section 3. Fiscal Impact of the Increased Frequency of Extreme Weather Events

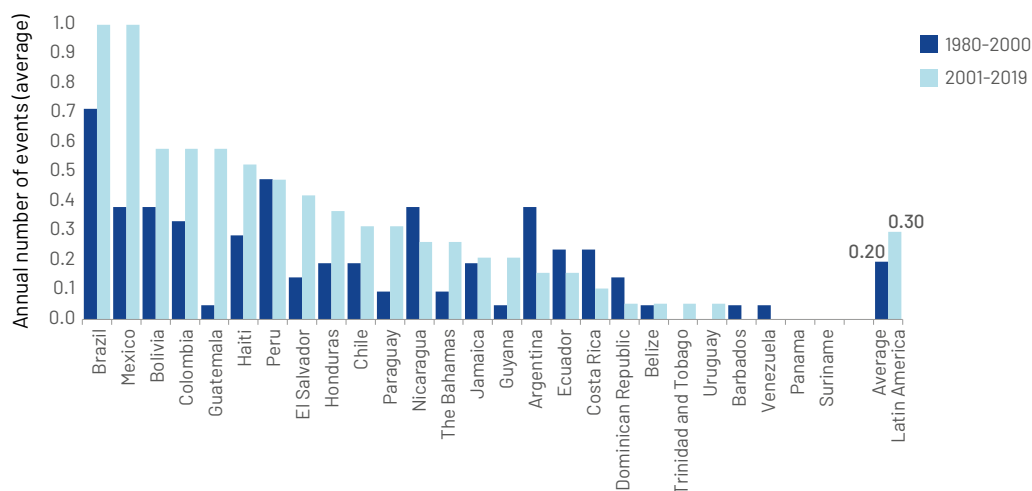
LUIS ALEJOS

In the current context of climate change, the magnitude, frequency, and duration of fiscal impacts caused by natural disasters⁴ are highly relevant to the public finances. In the 2001–17 period, 17 out of 18 years had the highest average temperatures since climate records began (Faust, 2018). This global warming process has coincided with a considerable increase in the annual frequency of climate-related natural disasters, from 222 in 1980 to more than 700 in 2016 (Munich Re, 2018).

Climate change is related to the increased occurrence and intensity of climate-related natural disasters (Mann et al., 2017; European Academies' Science Advisory Council, 2018; United States Global Change Research Program, 2018). This has led to a rising number of extreme weather events around the world, including in many Latin American and Caribbean countries (Figure 4). The average annual frequency per country in the region has increased by more than 50 percent in recent decades, from 0.2 per year in the 1980–2000 period to 0.3 per year between 2001 and 2019. Among the countries with the highest percentage increases were Guatemala, Guyana, Paraguay, El Salvador, The Bahamas, and Mexico. Based on available statistics, the average frequency for countries experiencing at least one extreme weather event increased from one event every eight years (1980–2000) to one every five years (2001–16). However, these figures hide significant variations, since countries such as Brazil and Mexico experienced one extreme event practically every year on average, while others such as Panama and Suriname faced none.

4 The types of climate change-related natural disasters are (i) meteorological, such as storms, extreme temperatures, and hail; (ii) hydrological, such as floods, landslides, and ocean waves; and (iii) climatological, such as droughts, glacier slides, and forest fires.

Figure 4. Frequency of Extreme Weather Events in Latin America and the Caribbean, 1980–2019



Source: IDB calculations based on data from EM-DAT (Centre for Research on the Epidemiology of Disasters, 2009) and Alejos (2018).

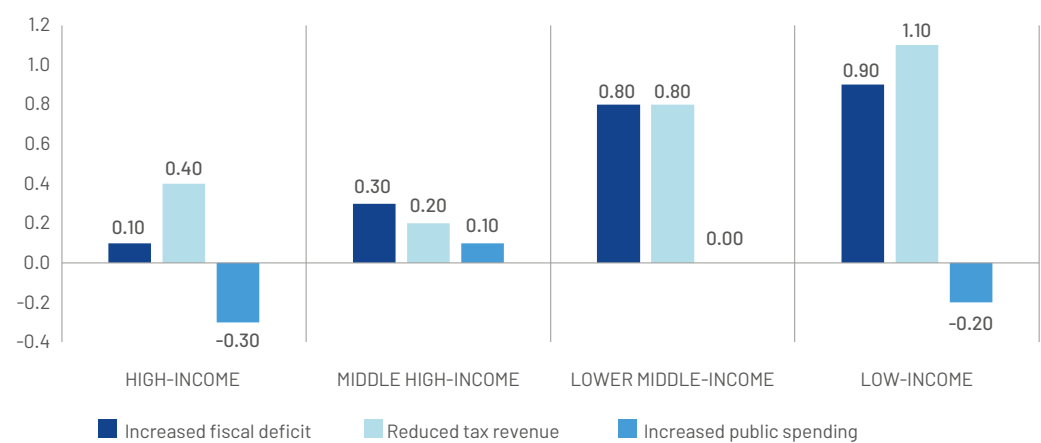
Extreme weather events can cause great human losses, as well as significant economic damage (Hallegatte et al., 2017). From a fiscal perspective, the greater frequency of these events implies a greater risk of negative shocks to the fiscal accounts, and it is therefore important to incorporate their occurrence into medium-term fiscal frameworks.⁵ When extreme weather events materialize, they tend to reduce fiscal revenue due to lower tax collection resulting from the impact on productive sectors. Likewise, the expenditures needed to respond to the emergency and subsequently rebuild affected public infrastructure lead to greater pressure on public spending. Both channels negatively affect the fiscal balance, weakening public finances. Shocks may also last for more than one period, frequently leading to increases in public debt, the abandonment or postponement of new investment projects, and procyclicality in fiscal policy, particularly in countries that lack adequate insurance mechanisms for natural disaster risk.

The magnitude of the fiscal impact resulting from the increased frequency of extreme weather events can be considerable. Against a backdrop of recovery after the coronavirus pandemic, the emergence of this type of risk may also negatively impact the fiscal consolidation efforts that will be required in the region. For example,

⁵ Although this section focuses on the channels of fiscal impact of extreme weather events, it should also be noted that similar negative fiscal effects can be caused by the concatenation of multiple non-extreme events in a short period of time, especially when conditions of high exposure and vulnerability exist in the countries.

Alejos (2018) estimates that the occurrence of at least one extreme event per year is associated with an increase in the fiscal deficit of 0.8 percent of GDP for lower middle-income countries and 0.9 percent of GDP for the low-income group (Figure 5) in the same year. The effects for high- and upper middle-income countries are far more modest and are not statistically significant. An interesting aspect is that most of the negative effect on public finances is channeled through a decrease in tax revenues. For lower middle-income and low-income countries, this reduction in public revenues is equal to 0.8 percent and 1.1 percent of GDP, respectively. Conversely, the contemporaneous effect on public spending is limited, and in the case of low-income countries there is a decrease in spending that may be the result of constraints in public sector access to credit.⁶ Combining these estimates with the rates of occurrence of extreme climatic events in Latin America and the Caribbean for the period 2001-19 yields an estimated annual fiscal impact of between 0.2 percent and 0.3 percent of GDP. This figure represents more than 10 percent of the average fiscal deficit (2.6 percent) observed in the countries of the region during this period.

Figure 5. Fiscal Impact of Extreme Climatic Events in Latin American and Caribbean Countries (by Income Group and Percentage of GDP)



Source: IDB calculations based on data from Alejos (2018).

Note: Values indicate the average impact of the occurrence of at least one extreme weather event on the fiscal variable indicated.

6 Despite these findings, there is evidence for Caribbean countries of increases in public spending in the wake of hurricanes, with effects that go beyond a fiscal cycle (Ouattara and Stobl, 2013). Likewise, it should be noted that the estimates by Alejos (2018) only reflect the net impact on the fiscal variables analyzed. This implies that policy instruments such as budget reallocations, which have a zero net effect on the fiscal balance and other aggregates, are not counted as part of the identified fiscal costs, even though there is evidence of their importance (see Benson and Clay, 2004).

In conclusion, the effects of climate change in the region have included an increase in exposure to extreme weather events, meaning that the potential fiscal effects of this trend may be significant. Although in the last 20 years Latin American and Caribbean countries have implemented adaptation measures to reduce their vulnerability and enhance resilience, they still face a series of challenges in addressing the potentially negative impact of climate change on the public finances. From an adaptation standpoint, these challenges include developing financial strategies for implementing countercyclical fiscal policies in the event of disasters, strengthening insurance mechanisms against the risk of catastrophic events,⁷ reorienting public investment toward resilient infrastructure, and using methodologies for efficiently quantifying and managing climate change- and natural disaster-related public spending.

Additionally, in terms of mitigation, the elimination of fossil fuel subsidies and design and implementation of green taxes remain pending in the region, an area in which Chile and Mexico are pioneers. As governments implement policies to address these problems, available financial resources will be used more effectively, the negative impact on fiscal accounts will be reduced, and support will be provided for global efforts to reduce the greenhouse gas emissions that accelerate global warming.

The next chapter provides greater detail regarding best practices for managing natural disaster and climate change risks, as well as progress made in Latin America and the Caribbean.

7 In 2009, the IDB created a contingent credit facility of US\$600 million that provides loans of up to US\$100 million, with disbursements triggered in the event of a natural disaster. The Bank also assists countries in obtaining disaster-related financing through the design and structuring of catastrophe bond issues.

Chapter 3

Governance and Risk Management of Natural Disasters and Climate Change

In view of the increasing intensity, frequency, and duration of extreme weather events, Latin American and Caribbean countries face the challenge of reducing the associated social and economic impacts. As indicated in Chapter 2, Section 3, the fiscal impact is heterogeneous across countries but can be significant—especially for the most exposed and vulnerable—and it is steadily increasing in importance.

However, the motivation and possible actions of finance ministries in this area go far beyond managing the fiscal impacts of climate-related disasters. As shown in this chapter, there are several examples of good practices in the countries of the region, motivated by evidence of the benefits of preventing and reducing climate vulnerabilities. Opportunities are also highlighted for finance ministries to intensify their contributions in two respects: by improving the legal framework and disaster management capacities across the different levels of the public sector and in the private sector (Section 1) and by defining the guidelines and rules for internalizing disaster risk assessments throughout the public investment project management cycle (Section 2).

Section 1. Disaster Risk Governance and the Index of Governance and Public Policy in Disaster Risk Management

SERGIO LACAMBRA AND GINÉS SUÁREZ

At the local level, climate change manifests itself mainly in the form of risk (Murray and Ebi, 2012). When risk stems from extreme hydrometeorological or climatic events, disaster risk management (DRM) is analogous to climate change adaptation. A priority within DRM is to strengthen governance, which refers to the capacity to address a public problem. This capacity is manifested through continuous and stable management by governments and private parties, which increases the effectiveness of adopted decisions and implemented policies and

helps to avoid a greater number of negative disaster effects. Strengthening disaster risk governance is one of the four priorities for action under the Sendai Framework 2015–30 (United Nations Office for Disaster Risk Reduction (UNDRR), 2020), which was endorsed by all Latin American and Caribbean countries.

1.1 Regulatory, Institutional, and Budgetary Conditions for Disaster Risk Management in Latin America and the Caribbean

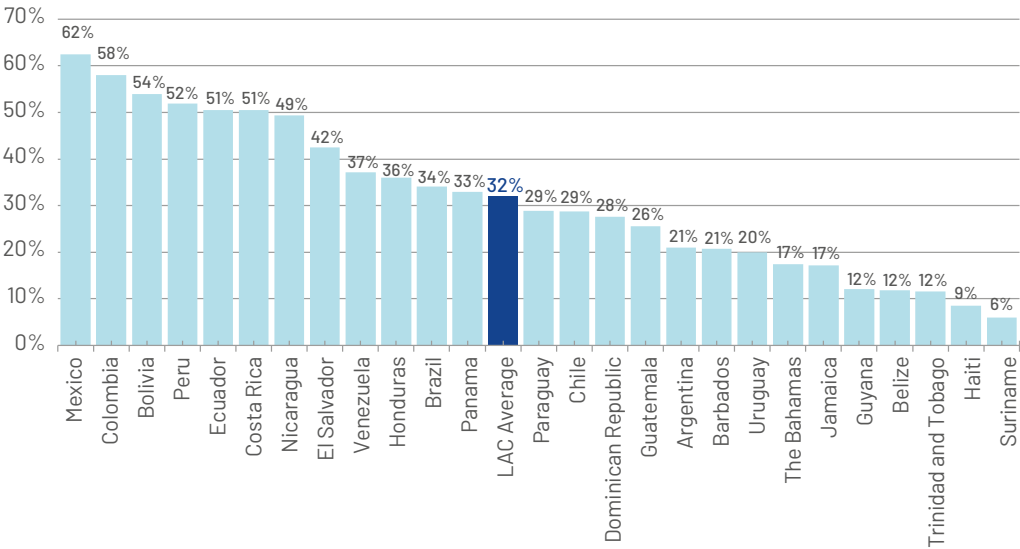
The IDB developed the Index of Governance and Public Policy in Disaster Risk Management (iGOPP) in 2012, with a view to measuring the level of disaster risk governance. The index is made up of 245 indicators that reflect the regulatory, institutional, and budgetary conditions for implementing effective public DRM policy, and it has been used to determine baselines for numerous public policy reforms in the region, as well as to monitor and evaluate their impact. There is empirical evidence that improvements of 1 percent in the iGOPP score are associated with average reductions of 3 percent in fatalities and up 6 percent in economic losses due to disasters (Guerrero Compeán and Lacambra Ayuso, 2020). The iGOPP⁸ is also a tool for reporting on a country's management of risk governance, as evidenced by the fact that it is used by some Latin American countries such as Mexico and Chile. Mexico, which has the highest iGOPP score among Latin American and Caribbean countries, has also adapted the index to measure the level of risk governance at the state level (Centro Nacional de Prevención de Desastres, 2017).

The iGOPP has been applied in all 26 IDB member countries in Latin America and the Caribbean.⁹ The average regional score is 31 percent, indicating ample room to improve disaster risk governance. The six countries with the highest scores are Mexico (62 percent), Colombia (58 percent), Bolivia (54 percent), Peru (52 percent), and Costa Rica and Ecuador (51 percent each) (Figure 6). Caribbean countries are concentrated at the bottom of this ranking, a situation that is worrisome for countries acutely exposed to the potential effects of climate change. This significant risk governance gap also extends to several Southern Cone countries (e.g., Argentina and Uruguay), where the agricultural sector—one of the most exposed to climatic events—is also one of the most important areas of economic activity.

8 Details of each national iGOPP survey, including graphics, verifiable supporting information, and other information, can be found on the IDB Riskmonitor platform: <https://riskmonitor.iadb.org/es/home>.

9 National iGOPP surveys were carried out in the period 2013–20. Comparisons between countries should be treated with caution since the scores for earlier surveys may be outdated. They can be reviewed at the following link: <https://publications.iadb.org/es/publicaciones?keys=igopp>.

Figure 6. Index of Governance and Public Policy in Disaster Risk Management (iGOPP), 2013-20



Source: iGOPP national reports published by the IDB between 2013 and 2020.

Most countries have adopted DRM laws and established civil defense arrangements in preparation for disaster response. By contrast, financial protection is a relatively new area for most countries. Nonetheless, senior finance officials in the region are concerned about preparing financially for the economic consequences of disasters, especially given the foreseeable impacts of climate change.

Finance ministries are directly responsible for 29 percent of iGOPP indicators and therefore play a fundamental role in the governance and creation of conditions for the implementation of effective DRM policy. In fact, no sector, sector ministry, or DRM coordination entity is directly responsible for such a high proportion of the indicators. The role of finance ministries in DRM becomes even clearer when one considers that they are directly responsible for 85 percent of indicators for the policy implementation phase. In other words, the effective implementation of risk management policy in the region depends directly on finance ministries. This is particularly significant given that the policy implementation phase in Latin America and the Caribbean is the weakest. This analysis shows that the role of these ministries in DRM policy relates not only to the financial protection component, on which many of the ministries' recent actions have focused, but is also cross-cutting to the entire policy process (particularly implementation).

To analyze the role of finance ministries in DRM policy in greater detail, the iGOPP indicators for which these ministries are responsible have been grouped into a series

of categories that cut across DRM components and public policy phases. These categories help to identify specific actions that these ministries can undertake to promote DRM policy (particularly its implementation), contributing decisively to the transition away from a vicious circle of disaster response to a virtuous cycle of risk management and ex ante adaptation to climate change. This will also allow current spending on emergency response to be gradually transformed into efficient and sustainable investment in risk reduction.¹⁰

These categories include the existence of an ex ante budget classifier for DRM funding and key regulatory actions for effective DRM implementation:

1 Existence of a budget classifier or object of expenditure in the national budget for allocating and monitoring resources dedicated to DRM activities:

DRM involves activities such as risk analysis, risk reduction, and disaster preparedness actions. Best practice calls for the creation of an object of expenditure, catalog, tag, or equivalent budget instrument to allow the identification and tracking of resources allocated ex ante to DRM activities. In the absence of a specific DRM classifier, entities that budget resources for this purpose allocate them to very different items, making it difficult to distinguish entities that do invest in resilience from those that do not, or from those that invest insufficient amounts given their high vulnerability to certain natural hazards. Since these investments cannot be adequately tracked, it is also more difficult to carry out precise cost-benefit analyses with a view to comparing them with other investments and properly justifying their prioritization. Lastly, it should be noted that the budget instruments analyzed do not include emergency-related budget items. Only a third of the 26 countries analyzed have such budget classifiers or tags. Two of the countries that have implemented this best practice are Panama and Paraguay. Through Administrative Resolution No. 030 of March 28, 2013 (Lacambra Ayuso et al., 2015), Panama's Ministry of Economy and Finance modified the budget classification manual and created a DRM object of expenditure. Meanwhile, Paraguay has budget classifier No. 831 "Contributions to social purpose entities and the National Emergency Fund" (by object of expenditure and financial control), which includes transfers to cover expenditure on prevention, mitigation, and preparation actions, in addition to response and rehabilitation activities (Ministerio de Hacienda de la República del Paraguay, 2020).

¹⁰ The complete IDB iGOPP methodology (2015) is available at: <https://publications.iadb.org/en/publication/17070/index-governance-and-public-policy-disaster-risk-management-igopp-application>. The iGOPP reports for each country are available at <https://publications.iadb.org/es/publicaciones?keys=igopp> and the details of the iGOPP surveys in each country can be found at <https://riskmonitor.iadb.org/>.

2 Existence of funds authorized to invest in ex ante DRM activities: Various studies show that a focus on ex ante processes in DRM helps to reduce losses from disasters and yields high rates of return. Returns on investments in risk reduction exceed US\$4 in reduced losses for every US\$1 invested (Moench, Mechler, and Stapleton, 2007; Mechler, 2016). Predictable budget funding is needed to implement such activities. Peru's investments in risk reduction, for example, increased from approximately S/60 million in 2010 to more than S/1.7 billion in 2018 as a result of Budget Program 068, "Reduction of vulnerability and response to disaster-related emergencies." The latter was created in 2010 as a result of a governance reform process that included, among other things, the approval of a modern law on comprehensive disaster risk management. Of the 26 countries analyzed in the region, only 27 percent have funds for ex ante investments in climate change adaptation, while only 42 percent have funds for DRM. One of the countries that is able to make these investments is Mexico, through its Natural Disaster Prevention Fund (FOPREDEN). Only 19 percent of the countries have included DRM among the eligible expenditures for their main development funds.

3 Regulatory actions for effective DRM policy implementation: Finance ministries have direct responsibility for regulatory actions that are key for effective DRM.

- a. Using appropriate technical standards for measuring probable disaster-related losses:** In gauging the optimal mix of different DRM instruments—including ex ante investment and risk retention and transfer—it is essential to rely on robust risk estimates. Decisions based on historical losses will inevitably lead to an underestimation of the disaster risk to which countries are exposed, and forecasts might not consider some disaster scenarios that could be critical for countries. In this sense, probabilistic disaster risk models can be used to estimate such losses, supporting the proper management of uncertainty. Only 38 percent of finance ministries in the 26 countries analyzed have quantified the resources needed to cover probable maximum losses due to catastrophic events for different return periods, while only 27 percent of these ministries have quantified the losses from frequent events. One of the countries that has quantified its probable maximum loss due to catastrophic events is The Bahamas, through studies carried out by the Caribbean Catastrophe Risk Insurance Facility (CCRIF), of which the country is a member. Regarding the quantification of probable losses due to frequent events, Mexico's Federal Risk Loss Estimation System (R-FONDEN) provides metrics for both low-recurrence and frequent events.

- b. Determining government fiscal responsibility in the event of disasters:** This aspect of governance is fundamental, as it is the basis for transitioning away from an approach in which DRM is treated as an implicit contingent liability (not reflected in the public accounts, in which the State is the implicit insurer of last resort) to one where it is treated as a contingent liability that is appropriately quantified and managed. This responsibility is made explicit in 42 percent of the 26 countries analyzed, including in Nicaragua through Law No. 337 creating the National System for Disaster Prevention, Mitigation, and Response of 2000 (Asamblea Nacional de la República de Nicaragua, 2014). Finance ministry responsibility for the financial protection component has been established in 53 percent of the countries; this includes El Salvador, where Agreement 1290 of 2012 (Pérez Trejo, 2015) created a Fiscal Risk Unit in the Ministry of Finance and assigned these responsibilities to it. Meanwhile, finance ministries have determined the requirements for insuring concessions in only 11 percent of the countries in the region, while just one ministry has issued guidelines to local authorities relating to financial protection against disaster risk (including, for example, insurance policies or equivalent arrangements for government assets, or arrangements for financial protection against disasters in cities with more than 100,000 inhabitants).
- c. Promoting insurance policies for public and private assets:** Risk transfer reduces the financial cost of disaster response, avoiding the need to reallocate budgetary resources or obtain more onerous sources of financing. Of the 26 countries analyzed in the region, only 39 percent have regulations requiring sector entities (ministries, secretariats, or their equivalents) to obtain insurance coverage for their public assets. This is an important deficiency, which if remedied would allow part of the fiscal responsibility associated with disasters to be transferred. At the same time, finance ministries are failing to encourage the purchase of insurance policies for private homes, with only 8 percent of the countries analyzed meeting this benchmark.
- d. Incorporating risk analysis into public investment processes:** Disaster risk reduction and climate change adaptation must include actions to mitigate existing risk, as well as ensuring that new development processes do not create new risks. This implies, among other issues, the need to incorporate resilience criteria into systems and processes for public investment planning and execution. Finance ministries are directly responsible for the following best practices for resilient public investment, among others:

- › Regulations requiring a disaster risk analysis in the pre-investment phase of the project cycle. Fifty percent of the 26 Latin American and Caribbean countries analyzed have this type of regulation. For example, the Dominican Republic approved technical standards for the National Public Investment System through Resolution No. 01-2010.
- › Regulations requiring a disaster risk analysis in other phases of the project cycle. Twenty three percent of the 26 countries analyzed have this type of regulations. Peru's General Guidelines for the Ex-Post Evaluation of Public Investment Projects, published by Ministry of Economy and Finance in 2012 (Chapter 5.4.7(d), Risk management), are an example of best practice.

1.2 Best Practices in Incorporating Natural Disaster-Related Risk into Public Investment Management

Incorporating risk analysis into the different phases of public investment requires technical specifications that are developed by entities other than the finance ministries. These specifications are essential to ensure that risk analyses are sufficiently technically robust to be used in designing more sustainable investments that take into account natural disaster risk and the effects of climate change. Developing these specifications requires adequate governance that includes the following elements:

- 1 Determining the party responsible for standardizing disaster risk analysis methodologies:** 38 percent of the 26 countries analyzed have this type of regulation.
- 2 Establishing a probabilistic approach and determining the appropriate scale for the risk analysis:** Only 15 percent of the 26 countries analyzed meet this requirement.
- 3 Existence of building codes applicable to public and private projects that include special design parameters for critical infrastructure:** 61 percent of the 26 countries analyzed have building codes.
- 4 Integrating disaster risk analysis into environmental impact assessments:** just over half of the 26 countries analyzed comply with this best practice.

Section 2. Disaster and Climate Change Risk Assessment in Public Investment Projects

MARICARMEN ESQUIVEL AND DANIELA ZULOAGA

Although the most serious impact of a disaster is the number of deaths, physical losses are also extremely important because they affect connectivity, basic services, and facilities such as hospitals, schools, and other critical infrastructure. In the worst case scenario, these losses can cause direct and indirect deaths. Infrastructure left inoperative by a natural phenomenon can also affect national and regional economic development in the medium and long term.

The countries in the region have identified the need for clear methodologies and resources for carrying out risk assessments to better understand and address vulnerability and resilience, while also incorporating uncertain variables into the project decision-making process.

Although sector ministries and agencies are responsible for the types of activities highlighted in Box 3, finance and planning ministries in many Latin American and Caribbean countries are responsible for defining guidelines that affect the development of public investment projects. This responsibility may involve regulating national public investment systems or participating in some of the phases of public project management. Accordingly, the actions of these ministries under the policies and regulations governing project design and evaluation can facilitate the inclusion of improvements such as those described in Box 3.

Box 3. Example of Disaster and Climate Change Risk Assessment in the Caribbean

A transportation project in the Caribbean seeks to increase departmental connectivity by improving a road of regional importance. The road has suffered repeated damages from extreme weather events, including hurricanes and heavy rains that in some cases have destroyed road sections, drainage structures, and bridges. Accordingly, project design has incorporated disaster and climate change risk factors to increase resilience. Firstly, existing studies and local knowledge were brought together to assess what had already been done and what still needed to be addressed. Thereafter, a workshop on failure modes was held in the field with local and other experts, aimed at carrying out a qualitative assessment of the hazards, road sections, and types of structures of most concern, as well as potential impacts and the nonstructural measures to be proposed. Lastly, a detailed quantitative risk assessment was performed to quantify expected losses for the road and propose specific resilience measures.

Various studies have shown that the benefits of resilience and disaster risk prevention are four times higher than their costs, in terms of avoided and reduced losses (Kull, Mechler, and Hochrainer-Stigler, 2013; Mechler, 2016; MMC, 2015; Moench, Mechler, and Stapleton, 2007; United Nations Office for Disaster Risk Reduction, 2011). It is clear, therefore, that financing prospective resilience measures is key. Risk assessments initially require additional resources during project preparation, but these ultimately serve to better inform risk reduction efforts, estimate the funding required for emergency response, and help prioritize prospective measures based on relevance and resource availability.

Ignoring the risks of disasters and climate change during preparation, design, and implementation of a project increases its exposure and vulnerability to natural hazards and could hinder the achievement of project objectives. This could shorten the life of a project or even cause deaths or economic losses, as well as incremental economic costs due to the need to make periodic investments to repair or replace structures (depending on the frequency and severity of damage). It is therefore important to incorporate the risk of disasters and climate change into the design and construction of projects in order to increase their resilience.

2.1 Implementing Best Practices in Public Project Evaluation and Management

The IDB has been supporting Latin American countries in identifying and evaluating disaster risk (including the effects of climate change) during the identification, preparation, and implementation phases of public investment projects (Barandiarán et al., 2018). This work is based on strengthening disaster risk detection processes and providing guidance to project teams, executing agencies, technical experts, and external consulting and design firms when conducting disaster risk and climate change assessments.

The procedure includes the screening and classification of projects as they are registered in the safeguards systems, together with a disaster risk assessment¹¹ and DRM plan in the case of projects classified as high risk, or a limited disaster risk assessment where a project is legitimately classified as moderate risk. The objective is to facilitate the identification and evaluation of disaster/climate change risks and resilience opportunities during the identification, preparation, and implementation phases of all relevant projects, thereby adding value to these projects.

11 A disaster risk assessment is a "qualitative or quantitative approach to determine the nature and extent of disaster risk by analysing potential hazards and evaluating existing conditions of exposure and vulnerability that together could harm people, property, services, livelihoods and the environment on which they depend" (UN-DRR, 2016). For the purposes of the IDB methodology, the assessment is accompanied by a disaster and climate change risk management plan that includes specific measures to reduce the risks identified in the assessment.

Experience has demonstrated the importance of supplementing information on threats and climate change with data on project vulnerability and criticality, as well as the need for risk assessments to include not only quantitative but also qualitative approaches, using a gradual and scalable process. The involvement of the various project counterparts is of utmost importance to ensure that assessments are relevant to project design, construction, and operation, as appropriate, and that the risk reduction measures that underpin project sustainability are maintained over time. The oversight role of executing agencies in identifying and assessing disaster and climate change risk is also important, as well as all the maintenance work.

The methodology involves a series of phases and steps in which efforts and resources are proportionate to risk levels. This means that not all projects require or would benefit from completing the entire process, due to the variety of project types and levels of complexity. The methodology allows some projects to exit the process at different stages depending on their risk rating and whether they meet certain requirements at each step. The methodology comprises three phases:

- 1 Screening and classification:** This phase provides an initial overview of the hazards that could affect a project and the extent to which it may be vulnerable to them. Accordingly, the review first analyzes the exposure to hazards (using a Geographic Information System platform with hazard maps for the region, including 10 relating to climate change). It then analyzes the criticality and vulnerability of the project and assigns it a disaster risk classification of low, moderate, or high. This classification serves as a first alert and determines the requirements needed to move forward with the next steps.
- 2 Qualitative assessment:** The purpose of this phase is to conduct a qualitative analysis of disaster and climate change risks, and it initially involves compiling all implicit and explicit project design and management considerations into a risk narrative identifying which issues are covered and which gaps remain. If deficiencies are found, then a formal qualitative method should be used to assess potential risks and solutions with local experts and stakeholders.
- 3 Quantitative assessment:** This phase consists of a numerical risk assessment and preparation of the disaster risk management plan. It involves modeling vulnerability, hazard, and risk for both the project itself and the surrounding environment and communities, using scientific and mathematical methods. To reduce risk, the disaster risk management plan must include both structural and non-structural measures. This detailed quantitative assessment provides added value as it places a number on expected economic losses due to

natural disasters and, more importantly, on the losses (or benefits) avoided by incorporating risk reduction measures. This quantification of risks and benefits is used in cost-benefit analyses to evaluate alternatives and their effectiveness, a key process that is normally used in national public investment systems.

The next chapter looks at how the proper, consistent identification of public budget spending on climate change can provide information to help improve decision making. Governments can evaluate how best to spend, taking advantage of the benefits of green public procurement and ensuring that public budgets are consistent with the objectives of the Paris Agreement.

Chapter 4

Managing Public Spending on Climate Change

Public expenditure management is a central issue within the climate agenda. In the long term, spending should be consistent with decarbonization and environmental sustainability objectives. In the medium term, it must improve the resilience of infrastructure and other physical public assets to the impacts of climate change and reduce social and economic vulnerabilities to disasters. In the short term, there is a need to avoid waste and reduce the environmental impact of public sector activities, while also improving the government's capacity to respond and provide services in disaster situations.

Identifying, quantifying, and evaluating cross-cutting spending on climate change helps to increase transparency and improve capacities to assess the quality of spending and align it with broader development goals. Section 1 of this chapter presents a synopsis of countries in the region that have begun to quantify climate spending and incorporate this dimension into the budget management cycle. However, progress still needs to be made in terms of implementation, which is limited in terms of both the number of countries and the quality of information generated, its standardization, international comparability, and integration with economic statistics.

Conversely, the ways in which governments carry out procurement can generate immediate benefits, reducing operating costs through the more efficient consumption of energy, water, and materials and providing additional reputational and image benefits for the government. Furthermore, given the economic weight of the public sector, sustainable public procurement generates broader benefits in terms of developing markets for new technologies that can ultimately accelerate changes in consumption and resource use throughout society. Section 2 of this chapter highlights examples of positive initiatives in the region and areas in which all countries can benefit, such as improvements in the regulatory framework, implementation tools, monitoring and measurement systems, and the evaluation of outcomes and impacts.

Section 1. Identifying and Evaluating Public Climate Expenditures

RAÚL DELGADO AND ALOISIO LOPES

1.1 Relevance of Public Spending to Climate Action

It is essential that the political leverage that finance ministries exert over public finances be focused on sustainable development as a national priority. Failing this, the transition to the resilient, net zero emissions economy will be even more protracted. The necessary transformation requires guidance, and government budgets and spending on public procurement are powerful tools. Government participation in the economy represents 20 percent of GDP in developing countries (including Latin America and the Caribbean) and double that level in the developed countries, at 40 percent (Izquierdo, Pessino, and Vuletin, 2018). This is recognized in the Paris Agreement, which includes “making finance flows consistent with a pathway toward low greenhouse gas emission and climate-resilient development” as one of its three objectives.¹²

Finance ministries play a central role in both including climate investments in national budgets and avoiding funding for actions contrary to the objectives of the Paris Agreement. For example, these ministries can help strengthen national public investment systems to include sustainability requirements (see Chapter 6). This contribution can also be reflected in decision-making processes to ensure consistency between budget expenditures and climate objectives (e.g., by avoiding allocations to activities that encourage fossil fuel consumption). On this last point, a recent study (Ferro et al., 2020) finds that five countries (Argentina, Colombia, Jamaica, Mexico, and Peru) allocate between 1.1 percent and 3.3 percent of their national budgets (Colombia and Peru, respectively) to actions that help combat climate change in five key sectors included in their nationally determined contributions (NDCs) (energy, transport, agriculture, natural resources and environment, and disaster risk management). However, the range of budget resources allocated to programs and projects with a negative impact on climate change efforts in these countries and sectors is markedly higher, ranging from 1.9 percent to 8.6 percent of the total budget (Jamaica and Mexico, respectively).

12 The Paris Agreement aims to strengthen the global response to the threat of climate change, in the context of sustainable development and efforts to eradicate poverty, and to that end will (a) hold the increase in the global average temperature to well below 2°C above pre-industrial levels and pursue efforts to limit the temperature increase to 1.5°C above pre-industrial levels, recognizing that this would considerably reduce the risks and effects of climate change; b) increase the ability to adapt to the adverse impacts of climate change and foster climate resilience and low greenhouse gas emissions development, in a manner that does not threaten food production; and c) make finance flows consistent with a pathway toward low greenhouse gas emissions and climate-resilient development.

1.2 Evaluation for Better Spending

Before spending more, Latin American and Caribbean governments may consider improving the quality of current budget expenditures. More efficient, effective, and equitable spending can lead to higher growth and a greater impact on national climate goals. In recognition of the fiscal constraints faced by various countries in the region (IDB, 2020b), the implementation agenda for the NDCs and long-term strategies (LTS) requires the design of financing strategies that help to reconcile national climate goals with available fiscal space. The proper identification of budget expenditures affecting climate change (both negatively and positively) is needed as a first step toward ensuring that governments and finance ministries can evaluate the efficiency, effectiveness, and equity of current budget expenditures. Efficiency entails doing things in the best possible way, both technically (doing things correctly) and in allocative terms (doing the right things). Effectiveness refers to achieving the expected outcomes, while equity relates to whether spending leads to equal opportunities (Izquierdo, Pessino, and Vuletin, 2018). Accordingly, in terms of sustainable development and combating climate change, the proper identification of climate expenditures in public budgets is needed for governments to be able to evaluate their main tool for financing the policy response to these challenges.

To ensure compliance with national goals and international commitments on climate change, governments will need to make informed decisions. However, most countries, including a majority of Latin American and Caribbean countries, lack consistent recent data on climate-related expenditures. As a result, finance and planning ministries are unable to assess the quality of spending or achieve a more precise understanding of fiscal risks deriving from climate change. In the region, only Ecuador, Honduras, Mexico, Nicaragua, and Peru have a budget mechanism, classification, or tagging system that allows regular, systematic tracking of the volume of budget resources dedicated to actions with an impact on climate change.

1.3 Identification and Classification of Public Climate Spending: Progress and Lessons Learned in Latin America and the Caribbean

Climate change budget labeling or tagging is the practice of identifying, measuring, and monitoring climate-relevant activities and expenditures (World Bank, 2020a). It can be viewed as a subset of broader statistical labeling and tagging activities that arrange units of statistical data within standard classification systems. One such system encompasses the Classification of the Functions of Government (COFOG) and the Classification of Environmental Protection Activities and Expenditures (CEPA), which are based on the System of Environmental and Economic Accounting.

However, current international methodologies and practices for tagging country climate expenditures have not been designed to connect to or be consistent with internationally recognized statistical and classification systems (Pizarro et al., 2020). As shown below, this lack of consistent, connected data limits the use of information yielded by tagging exercises.

There are currently no internationally agreed tagging methodologies for identifying climate change-related expenditures in public sector budgets, and this is still an emerging issue worldwide, even in developed countries (World Bank, 2020a). A review of the literature and IDB consultations with various countries in the region suggest that the lack of internationally agreed methodologies has resulted in multiple practices and methodological approaches that affect the quality and comparability of information. Internationally, there is widespread use of the Climate Public Expenditure and Institutional Review methodology (CPEIR) of the United Nations Development Programme (UNDP, 2015) and the Climate Change Public Expenditure and Institutional Review Sourcebook (World Bank, 2014). However, there is also a mix of individual country methodologies that incorporate features and recommendations from the OECD, World Bank, UNDP-CPEIR, and Climate Finance Group of Latin America and the Caribbean (GFLAC).

One consequence of the multiplication of practices and methodological approaches is a lack of data consistency and comparability across countries. This can even occur among sectors within the same country, due, for example, to deficiencies in standards for reviewing the quality of information (UNDP, 2018; World Bank, 2020a). Differences in practices and methodologies can be of several types: how climate expenditures are defined, what is and what is not a climate expenditure, which sectors are included, what weights are used to estimate the climate relevance of an expenditure, how the data is classified (disaster risk management, environmental protection, adaptation, mitigation, mixed, etc.), how the tagging system is applied during budget allocation or expenditure, and whether subnational government expenditures are included.

1.4 Key Advances in Latin American and Caribbean Countries and International Lessons Learned

In the last decade, 14 countries in Latin America and the Caribbean have either initiated or completed some type of monitoring of public spending on climate change or an evaluation of its quality. However, only 5 countries monitor these expenses on an ongoing basis (Table 1). It should also be noted that one-third of the IDB's 26 regional

member countries have some specific budget tagging system or classification relating to disaster risk management.¹³

Table 1. Progress toward Identifying and Evaluating Climate Change-Related Budget Expenditure in Latin America and the Caribbean

| Country | Tag/Budget Code | Negative Impact Tag | Expenditure Quality Evaluation (year) |
|-------------|----------------------------------|---------------------|---------------------------------------|
| Argentina | In process | – | No |
| Barbados | No | – | 2019 |
| Bolivia | No | – | 2015 |
| Chile | In process | – | 2016, 2017 |
| Colombia | Partial | No | 2016, 2018 |
| Costa Rica | In process | Possible | In process |
| Ecuador | Yes | No | 2016 |
| El Salvador | Designed, pending implementation | No | 2011, 2015, 2018 |
| Guatemala | Designed, pending implementation | No | 2018 |
| Honduras | Yes | No | 2017 |
| Mexico | Yes | Yes | No |
| Nicaragua | Yes | No | 2015, 2017 |
| Panama | In process | N/A | No |
| Peru | Yes | No | No |

Source: Authors' elaboration based on a review of country budgets (World Bank Group, 2014; Ministerio de Medio Ambiente de Perú, 2015; Ferro et al., 2020; Departamento Nacional de Planeación [Colombia], 2016; UNDP, 2018).

Echoing practices worldwide, the most widely used methodology or methodological process in Latin America and the Caribbean is the CPEIR, albeit with important adaptations. All countries have their own methodological approaches, and in most countries the tagging or classification systems consist of a mixture of methodological elements from the OECD (e.g., the Rio markers), World Bank, GFLAC, and UNDP-CPEIR. Ecuador, Honduras, and Peru stand out as they have climate change budget classifications, in addition to tags.

13 See Index of Governance and Public Policy in Disaster Risk Management (iGOPP), country reports: <https://publications.iadb.org/es/publicaciones?keys=igopp>

IDB consultations with Latin American and Caribbean countries, together with emerging evidence from various sources (Ferro et al., 2020; Pizarro et al., 2020; UNDP, 2018; UNDP, 2019; and World Bank, 2020a), highlight five key lessons for the design and use of climate change budget tagging and classification systems, deriving from both international and regional experience:

- 1 Governance arrangements for collecting budget information require greater efforts to ensure that **robust mechanisms are in place to review and validate the budget information collected**. This requires building solid governance frameworks that define the various processes and responsibilities, not only for budget departments, but for all participating institutions.
- 2 Budgets fund priorities that are largely determined before budget allocations are made. It is therefore **essential that countries establish long-term climate strategies and link them with investment programming** within the framework of national public investment systems. For example, Mexico's Ministry of Finance and Public Credit and the Costa Rican Ministry of Finance are currently developing methodologies to prioritize public investment programs and projects based on sustainability criteria (and, in the case of Costa Rica, alignment with its National Decarbonization Plan). (See Chapter 6 for the case of Mexico).
- 3 Although there is evidence that budget tags and classifications have helped provide greater insight into government actions on climate change, they must be integrated into national planning processes in order to enhance their usefulness and effectiveness. In other words, **the data generated must be able to inform decision making**.
- 4 Rather than waiting to see how the information from climate budget tagging feeds into decision making, it is essential that these tags serve a clear public policy objective from the outset—i.e., a priori, **information on public climate spending is required in order to evaluate it and ensure the desired impact**. For example, the Ministry of Finance of Costa Rica is currently building a climate change and biodiversity budget tagging system based on the National Decarbonization Plan.
- 5 Identifying public climate expenditures is not enough, nor should it be an end in itself. Rather, it is a necessary step in the process of evaluating public policy responses to climate change. When performing such evaluations, **it is**

crucial to connect climate spending data with economic and environmental information systems and accounts. Because tagging information is not connected to or consistent with international statistical standards and classifications, it is difficult to extract multiple data sources and connect them across policy domains. This is a key issue when analyzing climate change phenomena and evaluating the effective impact of public policy in this area.

1.5 Convergent Work Agenda of Finance and Planning Ministries on Climate-Related Public Expenditures

The leadership of finance and planning ministries is essential for ensuring that public expenditures are consistent with national decarbonization goals and increased resilience to climate change impacts. In light of the lessons learned described above, it is recommended that classifications be adopted that are consistent and compatible with international statistical and classification systems. For countries that have already implemented tagging systems, the consolidation of experiences by the Coalition of Finance Ministers for Climate Action provides important inputs to deepen their initiatives. Countries that have not yet done so have an excellent opportunity to benefit from international learning and best practices in this endeavor.

At the end of 2019, the IDB proposed a methodology for classifying public spending on climate change, for discussion by countries in the region. It includes a set of climate expenditure definitions that form the basis for the proposed classification system, and it is consistent with existing accounting systems and international classifications. Its main features include a classification based on criteria of the primary and secondary purposes of expenditure, addressing the multisector nature of climate actions. It also includes expenditures for the management of natural disasters associated with extreme weather events.

As climate change is a cross-cutting issue, the corresponding budget items are allocated not only to environment ministries, but also to other sector ministries and agencies, such as energy, agriculture, transportation, infrastructure, housing, and civil defense. Accordingly, the responsibilities of each participating institution in the process need to be clearly defined. These may include, for example, responsibilities during the initial identification phase, validation of the proposed classification system, integration of the system into the budget, and, subsequently, the execution, collection, evaluation, reporting, and dissemination of information on climate expenditures.

The implementation of climate expenditure tagging supports the efforts of finance ministries to improve budget management processes, enhance transparency in public spending, and link these to broader development objectives. The climate change

dimension needs to be integrated into the various stages of the budget cycle and into its management system and tools. Implementation strategies can be gradual, both in terms of institutional coverage (central government, subnational governments) and sectors (starting with those most relevant for climate policy) or types of resources (expenditures with a negative impact, revenue, subsidies). With appropriate adaptations, tools and processes for identifying climate expenditures can be applied to other issues such as gender, biodiversity, or the Sustainable Development Goals (SDGs).

Section 2. Introducing Climate Change Criteria into Public Procurement

JULIANA ALMEIDA, LESLIE HARPER, AND DANIEL SÁNCHEZ

The following definitions help to clarify what it means to introduce climate change strategies and perspectives into public procurement (green procurement):

- › **United Nations:** Sustainable procurement is about combining social and environmental factors with financial considerations when making purchasing decisions. It involves looking beyond traditional economic parameters and making decisions based on life cycle costs and associated environmental and social risks and benefits, as well as the broader environmental implications (United Nations Environment Programme, 2008).
- › **IDB:** Green procurement is defined as the acquisition of goods, works, services, or consultancies whose results have the least possible harmful effects on the environment, human health, and safety when compared to other competing and similar acquisitions (Salazar Cota, Fernández, and Dalaison, 2018).




Sustainable procurement takes into account environmental, economic, and social elements that represent multiple benefits for the environment and society as a whole. For example, green procurement can allow governments to encourage the construction of energy efficient buildings and the growth of micro, small, and medium-sized enterprises, while also fostering innovation.

2.1 Trends in the Implementation of Public Procurement for Climate Change

Although there are many ways to implement the aforementioned principles, the most accepted approach in public procurement involves (i) reducing the consumption of resources, utilities, and energy; (ii) avoiding waste and pollutant emissions; (iii) increasing the quality of goods and services purchased; (iv) protecting biodiversity; (v) reducing environmental protection costs; (vi) increasing transparency and enabling better value-for-money analysis of private sector bids; (vii) promoting innovation and green jobs; and (viii) working strategically with suppliers (OECD, 2015).

Green procurement, which includes procurement with a climate change perspective, expresses the power of public sector purchasing to create both supply and demand incentives for the acquisition of goods and services without harmful environmental effects (Kumar Shakya, 2019).

Table 2. Most Common Areas of Public Expenditure for the Implementation of Green Procurement

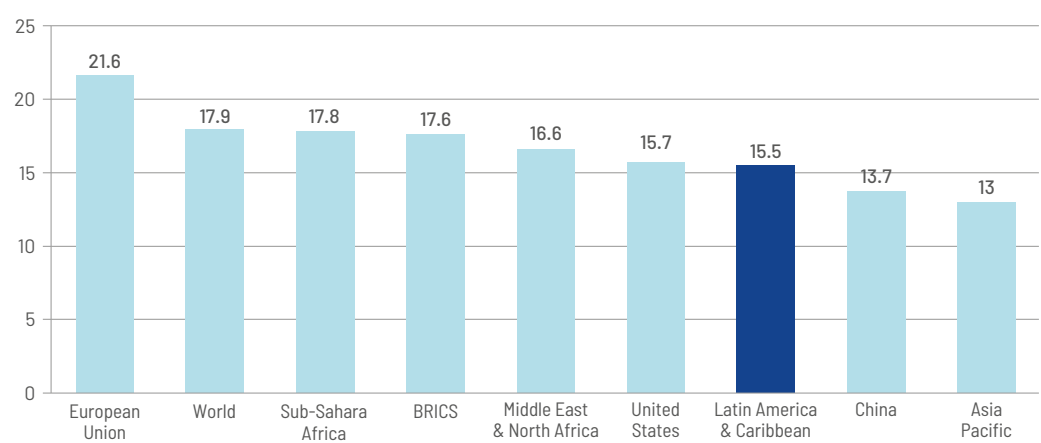
|  GOODS |  SERVICES |  PUBLIC WORKS |
|---------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------|
| Air conditioning | Postal services | Airports |
| Fuel | Data centers | Buildings |
| Furniture | Electricity | Ports |
| Health supplies | Food | Power plants |
| Information technology | Gardening | Prisons |
| Electricity | Consultancies | Railroads |
| Office supplies | Furnishings | Roads |
| Paper | Software | Schools |
| Vehicles | Waste management | Water treatment |

Source: OECD (2015).

2.2 Benefits of Green Procurement

Given that public procurement represents between 15 percent and 20 percent of a country’s GDP—and up to 30 percent in emerging economies—the potential impact of green policies in this area is quite high.

Figure 7. Public Procurement as a Percentage of GDP, Worldwide and by Region



Source: *Latin American and Caribbean Economic System* (2014).

BRICS: Brazil, Russia, India, China, and South Africa.

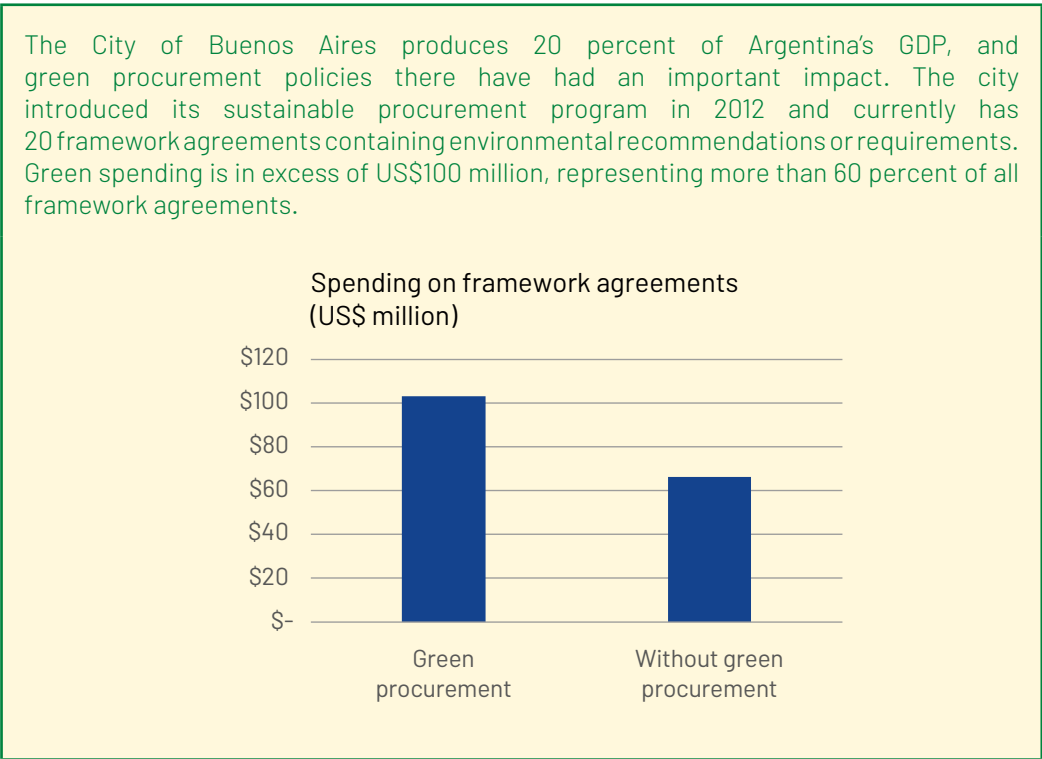
There are several reasons why the region’s countries may benefit from incorporating environmental strategies and perspectives into their public procurement systems, including the following:

- › **Fulfilling national policies and international commitments:** Green procurement is a means of both demonstrating alignment with national policies in the area of environmental sustainability and of making progress toward meeting international goals and commitments. The role of public procurement is so relevant to climate change that in late 2017, three of the largest existing city networks (the International Council for Local Environmental Initiatives, the Cities Climate Leadership Group, and the Covenant of Mayors for Climate and Energy) announced their interest in supporting sustainable public procurement as part of their strategies to accelerate implementation of the Paris Agreement.
- › **Environmental benefits:** Green procurement can help mitigate problems such as deforestation, greenhouse gas emissions, and waste generation. For example, the European Union estimates that CO₂ emissions could be reduced by 15 million

tons per year if the entire European Union adopted the criteria used by the city of Turku, Finland for purchasing electricity and office equipment (European Commission, 2016).

- › **Economic benefits:** Buying green can generate significant savings for governments over time, since these inputs use less energy, produce less waste, and last much longer. Procurement based on environmental strategies and perspectives takes into account not only the purchase price but also the full costs of using and disposing of a good, including operation, maintenance, repair, and disposal (Sieb, 2011). There are three main sources of savings from green procurement:
 1. Medium- and long-term savings that come from taking life cycle costs into account. For example, equipping an office to be energy efficient will be seen as an extra cost at first but will save energy in the future.
 2. Reductions in the price of green inputs due to expansion of the market. The public sector can create a market for green products, creating incentives for the private sector to produce these at a scale that leads to lower prices.
 3. Reductions in spending on insurance and legal services required as a result of pollution-related violations or the use of materials hazardous to health (European Commission, 2016).
- › **Social benefits:** The implementation of this policy also brings benefits such as improvements in the quality of products and services, which in turn leads to improvements in occupational health and labor practices (OECD, 2015). Green public procurement also has a positive effect on job creation. In South Korea, for example, the Ministry of the Environment introduced legislation to promote green purchasing in 2005, and to date, 13,000 new jobs have been created in companies with environmentally sustainable practices (OECD, 2015). There are also health-related benefits. In Washington State in the United States, it was shown that 6 of every 100 employees became ill after working with cleaning fluids containing harmful chemicals. This led to expenses of US\$725 per employee, in addition to time off work.

Box 4. Green Procurement: The Case of Buenos Aires



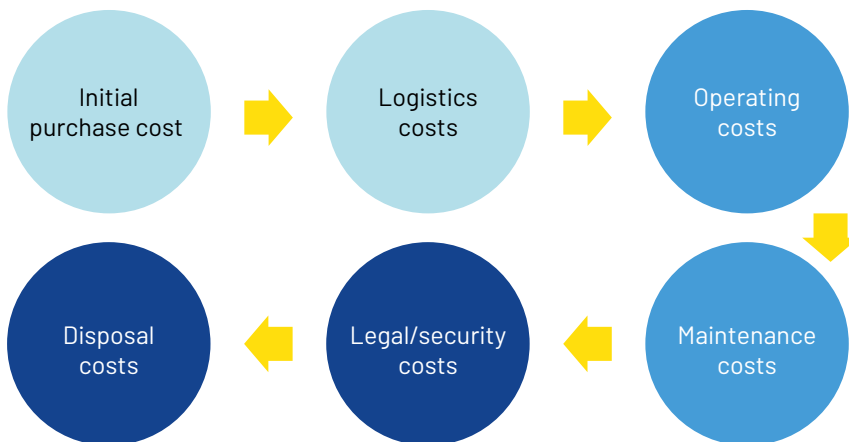
- › **Market benefits:** Public procurement may become a significant market for green products and services; to serve it, the private sector will need to adopt more innovative approaches to production. This will have positive repercussions for the entire production chain, which will be able to incorporate better innovation, sustainability, and quality practices into its operations.
- › **Policy benefits:** In many countries, there is growing concern for the environment and the impact that the public sector has on it. By showing greater awareness of the ecological impact of their decisions, governments can not only increase environmental awareness among the public, but also demonstrate that they contribute through initiatives that create a healthier environment for their citizens. Furthermore, the potential savings from green procurement can be measured (particularly those obtained by factoring in the total life cycle cost of a product), leaving resources available for other key public sector initiatives that can be pointed out to those responsible for developing public policy (European Commission, 2016).

2.3 Life Cycle Costing

The most common factor in determining public procurement of a product or service has traditionally been the initial purchase price. This perspective is directly related to short-term budget savings, yet there is a growing understanding that the best value for money does not always flow from awarding contracts to the lowest bidder. Analyzing and assessing all of the factors associated with operating, maintaining, and disposing of an asset highlights the existence of additional expenses throughout its life cycle. These expenses have medium- and long-term budgetary implications and also generate costs in terms of environmental impact.

Life cycle costing can therefore be defined as an economic assessment that considers all significant and relevant costs over a period of analysis, expressed in monetary value. Projected costs are those needed to achieve a given level of performance, including reliability, security, and availability (Perera, 2009). The idea behind life cycle costing is that buyers factor in not only the price of an asset when purchasing it, but also the costs of delivery, installation, start-up, security, operation (utilities and maintenance), end-of-life (disposal costs), recycling, and remodeling, among other things (Figure 8). This is a critical component in establishing value for money—in other words, purchasing decisions must consider the full life cycle over the medium and long term (International Institute for Sustainable Development, 2015).

Figure 8. Typical Life Cycle Costs to Consider When Procuring a Product or Service



Source: Authors' analysis based on information from the International Institute for Sustainable Development (2015).

Life cycle costing is important for two main reasons. The first is the impact that a product can have if it is more (or less) efficient in relative terms (e.g., energy saving light bulbs). The second is that in many countries, the government is the largest source of

procurement and is therefore in a position to create a local market for green products, improving their economic viability for the firms that produce them.

One barrier to considering life cycle costs in public procurement has been a perception of higher costs in terms of environmental assessments and the initial product price. Other barriers are a lack of political support, minimal capacity to implement life cycle costing (particularly the evaluation of green goods and services), and a lack of coordination between government officials in the procurement and environmental protection areas.¹⁴

2.4 National and Sector Policies to Promote Green Public Procurement

Several countries have policies to promote sustainable procurement and the use of green technologies in goods, works, and services. These measures are used to grant benefits and awards to institutions that adopt sustainable criteria in their procurement. In some cases, these policies are formalized through specific regulations and/or requirements for the ecolabeling of certain products.

Likewise, there are international associations that advocate the elimination of certain materials considered pollutants, such as mercury in medical devices. According to “Sustainable Public Procurement in Latin America and the Caribbean: Actions towards implementation” (Organization of American States, IDB, and Inter-American Network on Government Procurement (INGP), 2020), 20 of the 23 Latin American and Caribbean countries studied have a regulatory framework for public procurement that facilitates the implementation of sustainable public procurement. Meanwhile, 21 countries have carried out implementation actions, 11 have implementation tools, and 4 have measurement and monitoring systems. Additionally, 3 countries have allocated specific budget funds for the implementation of sustainable public procurement strategies. Lastly, 19 of the 23 countries analyzed are aligned with the SDGs.

At the same time, there are a variety of national and international standards that establish environmental guidelines for products and works, and these are used as benchmarks for formulating specifications in green procurement bidding documents. In some cases, national legislation establishes mandatory standards or special certifications that must be considered. In other cases, they are used as a criterion for prioritizing proposals during the selection process.

According to a study by the INGP, outstanding work is generally being carried out in the region in terms of social and environmental sustainability and support for micro, small, and medium-sized enterprises (MSMEs) through sustainable public procurement. For example, countries such as the Dominican Republic and Chile stand out as having

14 See https://ec.europa.eu/environment/gpp/barriers_en.htm.

specific programs to support women-led MSMEs, while Paraguay is a regional leader in family agriculture.¹⁵ Other countries such as Costa Rica and Chile are leaders in their respective sub-regions, followed by the Dominican Republic and Uruguay, which have also made significant progress. These countries' achievements confirm the feasibility of adopting sustainability criteria in public procurement processes and of achieving the objectives set (Organization of American States, IDB, and INGP, 2020).

To successfully implement green procurement in government, the following steps should be considered:

Preparation phase:

- › **Business case:** Verify alignment with national policies and develop the regulatory, economic, and financial justifications for adopting sustainability criteria in government procurement.
- › **Market studies:** Build extensive knowledge of the supply of green products and services, including suppliers with the capacity to develop them. This will allow identification of the market niches that offer greatest benefits in the short and medium term, as well as those that need to be incubated for the long term.

Implementation phase:

- › **Integrate green principles:** Start by preparing a needs analysis and plan. Incorporate these into the technical specifications, evaluation criteria, and contractual clauses of the selected procurement processes.
- › **Training and technical assistance:** Design and implement training programs for public procurement officials, as well as assistance and technical support programs for suppliers.
- › **Coordination:** Create mechanisms for communication and interagency discussion between the purchasing entity, line ministry, and lead agencies.

15 Final report of the INGP Workshop “Compras Públicas Sostenibles y Empresas de Triple Impacto” [Sustainable Public Procurement and Triple-Impact Businesses], August 12-14, 2019, San José, Costa Rica. Available at <https://secureservercdn.net/198.71.233.44/u1y.854.myftpupload.com/wp-content/uploads/2019/07/Report-workshop-CPS-Costa-Rica.pdf>.

Evaluation phase:

- › **Information and data:** Implement mechanisms to capture and curate data relating to green procurement processes. This will allow data mining and business intelligence technologies to be used in future to evaluate and improve the program.

In the next chapter, the authors describe the types of policies that are required to generate more sustainable public and private investment. They analyze the need to develop both long-term planning tools and reforms to national public investment systems that treat sustainability as a broader concept than environmental sustainability alone.

Chapter 5

Sustainable Public Investment

Section 1. Sustainable Infrastructure and Public Investment Management

HUÁSCAR EGUINO, MARCIA BONILLA-ROTH, AND MARIANA SILVA

Infrastructure is a key driver of economic growth, employment, and improved quality of life. In the midst of the COVID-19 pandemic and concerns about the growth prospects of the global economy, infrastructure investment plays an especially important role, boosting aggregate demand and laying the foundation for future recovery. It is also a key element in combating climate change, promoting equity, and boosting sustainable development. According to the World Bank (2020c), approximately 70 percent of global greenhouse gas emissions are generated by the construction and operation of physical infrastructure. This is clearly part of the problem with regard to climate change, but also part of the solution. Technological advances have opened up new opportunities for sustainable infrastructure, especially by reducing the costs of low-carbon technologies such as renewable energies. In this regard, it is encouraging to observe a growing desire to prioritize sustainable infrastructure investment as part of green recovery packages to address the economic impact of the pandemic.

The impact of higher levels of investment in sustainable infrastructure will depend on the strength of public institutions and fiscal capacities at the national and subnational levels. This includes, in particular, the ability to develop and manage sustainable infrastructure project portfolios that include resilience criteria in the project cycle and are consistent with national decarbonization strategies and international emission reduction agreements. Furthermore, financial innovation is an integral part of the transformative nature of the sustainable infrastructure agenda. Mobilizing financing on a larger scale will require using fiscal space creatively (while still observing fiscal responsibility rules), leveraging finance to a greater degree, and promoting greater private sector participation. These are the main topics explored in this chapter, with the aim of identifying lines of action in the public investment sphere that can be implemented to promote greater efficiency in sustainable infrastructure spending.

1.1 Challenges and Opportunities in Latin America and the Caribbean

Fulfilling the goals of the Paris Agreement and the Sustainable Development Goals (SDGs) represents an opportunity to promote a new, more sustainable and inclusive form of development in Latin American and Caribbean countries. In this context, public investment in sustainable infrastructure becomes a central element in the move toward a low-carbon economy.

Sustainable infrastructure includes works and services that have been designed, built, and operated with sustainability of the entire life cycle in mind, including economic, financial, institutional, and socioenvironmental (including climate resilience) aspects (IDB, 2019a). Although there is consensus on the importance of expanding sustainable infrastructure, one of the main difficulties has been a lack of tools for incorporating climate action into all phases of the project cycle. This difficulty is the particular result of the absence of long-term strategies that serve as a reference framework to identify and program new sustainable infrastructure.

According to recent studies by Armendáriz and Contreras (2016), very few countries in the region have the medium- and long-term planning and policy instruments needed to provide a framework for proper identification and selection of public investment projects—especially those for sustainable infrastructure. This deficiency is found in all sectors and at all levels of government (Eguino, 2020) and is even more acute when it comes to integrating climate change and decarbonization considerations. In Latin America and the Caribbean, only Costa Rica has published a National Decarbonization Plan. Mexico has presented its long-term strategy to reduce carbon emissions to the United Nations Framework Convention on Climate Change, while Argentina, Chile, and Colombia are in the process of preparing their strategies and plans.

Additionally, weaknesses in planning systems are aggravated by the public sector's limited capacity to deal with the contractual, institutional, and technical aspects of project preparation and execution, as well as the challenges involved in mobilizing financing to make sustainable infrastructure works viable. In this regard, a particularly important issue is the difficulty experienced by countries in the region in incorporating climate change issues into national public investment systems. Progress in this area has been partial and limited, in many cases, to pilot projects. Box 5 highlights the progress made by Chile and Costa Rica.

Box 5. The Cases of Chile and Costa Rica**Chile: Integrating Climate Change into the Public Investment System**

As part of its efforts to integrate climate change into the formulation and evaluation of public investment projects in the National Investment System, Chile has made a number of advances in terms of developing methodologies and establishing the social price of carbon. This has made it possible to quantify the impact of greenhouse gases, improve information for decision making on public spending, support reductions in long-term emissions, and promote greater investment in climate-resilient infrastructure. Achievements have included the following:

Complementary Methodology for Assessing Disaster Risk in Public Infrastructure Projects (2018). The objective of this methodology is to incorporate disaster risk analysis and assessment into the preparation and evaluation of projects submitted to the National Investment System. It serves to guide planners, evaluators, and decision makers regarding the design and execution of infrastructure projects in areas exposed to threats, taking into account not only their suitability but also possibility of mitigation or adaptation measures. Details can be found at <http://sni.ministeriodesarrollosocial.gob.cl/download/metodologia-complementaria-para-la-evaluacion-de-riesgo-dedesastres-de-proyectos-de-infraestructura-publica/?wpdmdl=3158>

Updated social price of carbon. Chile first estimated the social price of carbon in 2013, using a proxy value based on the market price of instruments traded under the Clean Development Mechanism (US\$4.05 per ton of CO₂). International concepts and methodologies for quantifying social costs and shadow prices were updated in 2016, and the United Kingdom's model was selected based on the abatement cost curve that allowed the country to meet its mitigation goal under the Paris Agreement (an average value of US\$32 per ton of CO₂). The National Investment System is currently working to incorporate the quantification of greenhouse gas-related externalities into social evaluation methodologies for projects, with the aim of improving their financial sustainability and reducing emissions. Use of this methodology in the ex ante project assessment stage has shown that having a social price of carbon allows changes in CO₂ emissions to be estimated for public buildings, roads, airports, rural drinking water, and freight and passenger rail projects. The assessment includes the quantification of externalities associated with increases or reductions in greenhouse gas emissions, which is important for transportation, energy, and waste projects. Details can be found at <http://sni.ministeriodesarrollosocial.gob.cl/download/precio-social-co2-2017/?wpdmdl=2406>.

Energy Efficiency and Social Costs in Buildings (ECSE). The social price of carbon has also been incorporated into the social evaluation of public building projects through the use of energy efficiency measures, and a tool to measure energy efficiency and social costs in buildings (ECSE) has been developed for this purpose. This software program supports quantification of the impacts and marginal benefits of interventions and provides estimates of social returns and energy efficiency in building projects. Details can be found at <http://sni.ministeriodesarrollosocial.gob.cl/download/manual-ecse-manual-para-el-software-eficiencia-energetica-y-costos-sociales-en-proyectos-de-edificacion-ecse/?wpdmdl=3322>.

Infrastructure Services Climate Change Adaptation and Mitigation Plan 2017-22. This plan was developed “to address the impacts of climate change in the infrastructure sector and adapt works for the benefit of the country.” It constitutes a reference framework that establishes climate change adaptation and mitigation guidelines for Ministry of Public Works departments involved in executing infrastructure works (Roads, Hydraulic Works, Port Works, Airports, Architecture, Planning, and Coordination of Concessions). The Ministry is also committed to climate change mitigation and aims to reduce greenhouse gas emissions in infrastructure works in order to support low-carbon development. Details can be found at <https://biblioteca.digital.gob.cl/handle/123456789/1423>

Climate Change Adaptation Plan for Cities 2018-22. Chile's National Action Plan for Climate Change (PANCC) emphasizes the high degree of vulnerability experienced by cities. The Ministries of Environment and Housing and Urban Development prepared the Climate Change Adaptation Plan for Cities, which is to be implemented over a five-year period. The plan underwent a citizen consultation process, which helped to enrich the final proposal. Details can be found at https://mma.gob.cl/wp-content/uploads/2018/06/Plan-CC-para-Ciudades_aprobado-CMS-ene2018-1.pdf

Costa Rica: Managing Disaster Risk in Public Investment

Through its Ministries of National Planning and Economic Policy; Public Works and Transportation; Agriculture; Environment and Energy; and Housing and Human Settlements, Costa Rica has made important progress in incorporating climate action into the planning, programming, and evaluation of the infrastructure and services investments required by the country. This includes integrating disaster risk analysis and management into the investment project life cycle as part of implementation and operation of the National Public Investment System, as well as developing risk assessment methodologies and tools that ensure greater sustainability and resilience in public infrastructure works. Achievements have included the following:

Methodological Guide for the Identification, Preparation, and Evaluation of Public Investment Projects. This incorporates climate change-related risk elements into the project cycle. Specifically, it covers analysis of the location of projects, identification of vulnerabilities, quantification of project risks from natural disasters, analysis of risk reduction alternatives, and quantification of the costs and benefits of disaster risk mitigation, among other things. The authorities are currently in the process of including a gender and inclusion variable. Details can be found at <https://documentos.mideplan.go.cr/share/s/YeyCzwxXTC0lv-ZdbBC3Bg>.

Natural hazard analysis methodology for public investment projects in the profile stage. This methodology is applied during the profile (preinvestment) stage of projects in the National Public Investment System, and it includes the use of secondary information, insights obtained from tools, and site visits. This supports the development of basic criteria for technical decisions to protect public investments against the occurrence of natural phenomena. Details can be found at <http://www.mag.go.cr/bibliotecavirtual/H50-5991.pdf>.

Loss Module for Natural Disasters. This app has multiple applications for decision making and also supports various studies on the country's territorial and sector vulnerabilities. It makes data available to the public on the economic impact (by subnational unit and sector) of hydrometeorological and tectonic events that have been accompanied by declarations of emergency. The purpose of the initiative is to generate systematized information that serves national planning objectives; provide insight into regional vulnerabilities and the sector impacts of natural phenomena; and lay the groundwork for monitoring the effects of climate change in this field. Details can be found at <https://www.mideplan.go.cr/perdidas-ocasionadas-fenomenos-naturales>.

Proposed Resilient Infrastructure Decree. The purpose of this regulation is to establish general guidelines requiring that institutions executing public infrastructure works carry out a risk assessment using a multi-hazard approach that takes current scenarios and projections for climate change and climate variability into account. The decree will apply to technical and administrative decisions at all stages of the project life cycle, and it is currently undergoing public consultation. Details can be found at shorturl.at/afqF4.

Since 2008, Latin American and Caribbean countries have invested an average of over 3.5 percent of annual GDP in infrastructure. However, studies estimate that the region needs to invest around 5 percent of its GDP over the next 20 to 30 years to close its infrastructure gap (Perrotti and Sánchez, 2011; Andean Development Corporation, 2013; Serebrisky et al., 2017). Such investment would require an additional US\$100 billion per year, yet this excludes required investment in climate change mitigation and adaptation, estimated at around US\$30 billion annually (Serebrisky et al., 2017).

In addition to low levels of investment, another reason for concern is the poor quality of infrastructure and services in the region. Latin America and the Caribbean ranks below the advanced economies and high-growth Asian economies on the World

Economic Forum's infrastructure quality indicator. From a public policy standpoint, this highlights not only a need to mobilize (or reallocate) greater funding for sustainable infrastructure investment, but also the need to improve the quality of that investment.

1.2 Role of Sustainable Infrastructure Policies

There are four ways in which public policies can promote greater public and private investment in sustainable infrastructure:

- 1 Establishing long-term strategies and linking them to investment programming:** The programming of sustainable infrastructure works should be carried out within the framework of national development strategies and plans, whether sector-based or of a specific nature (such as decarbonization strategies). In turn, the investment programming of sustainable infrastructure works should be consistent with medium-term fiscal frameworks, as well as the government's capacity to manage public debt levels that are sustainable in the medium and long term.
- 2 Improving the financial policy and regulatory framework:** This will involve changing incentive structures to promote infrastructure that is consistent with net zero emissions and increases countries' adaptive capacities. The actions required to move in this direction include incorporating climate change variables into the different stages of the project cycle (from ex ante evaluation to impact evaluation), as well as investment programming and prioritization processes. The financial policy and regulatory framework must also be improved to facilitate investment in sustainable infrastructure through the use of public-private partnerships. The latter will become increasingly important given that the public sector will be unable to meet all financing needs and will require private capital.
- 3 Strengthening public investment management:** Public investment is on a downward trend, exacerbating infrastructure gaps and highlighting the need to improve the quality and efficiency of investments. This situation should be addressed by expanding public management capacities in all sectors and at levels of government. Some of the priority management areas include (i) improving project planning and selection tools by developing baseline studies, revising project selection criteria (Box 6), and improving investment coordination and consultation; (ii) improving the instruments that support investment programming, such as project banks and the preparation of plans or programs

to meet financing requirements; (iii) expanding project evaluation capabilities, incorporating the socioeconomic cost of carbon into ex ante assessments, establishing preinvestment funds, and assessing the risks of natural disasters; (iv) improving project execution, encouraging the adoption of low-carbon technologies and paying due attention to operation and maintenance aspects as a means of extending the useful life of assets; and (v) evaluating the achievement of project development objectives so that required

inputs and good practices are in place for the design of new investments. Box 6 presents the case of Mexico and its initiatives to prioritize public investment programs and projects based on sustainability criteria.



Public investment is on a downward trend, exacerbating infrastructure gaps and highlighting the need to improve the quality and efficiency of investments.

4

Mobilizing financing: Risk mitigation and other project financing instruments should be used to leverage resources earmarked for investments in sustainable infrastructure. Multilateral development banks should play a key role in drawing in resources from large institutional investors interested in investing in green projects or projects that eliminate or reduce carbon emissions. This is particularly important in Latin American and Caribbean countries, where it is possible to innovate with financial instruments and deepen the development of domestic capital markets, or where sovereign risk ratings are attractive to institutional investors. Such is the case of Chile, which aims to support sustainable development and meet infrastructure needs by attracting foreign investment into green assets (see Chapter 6, Section 3). Chile has demonstrated its commitment and international leadership in the fight against climate change by becoming the first issuer of sovereign green bonds in the Americas and the first non-European issuer of this type of bond in Europe.

Box 6. Mexico's Experience of Prioritizing Public Investment Programs and Projects

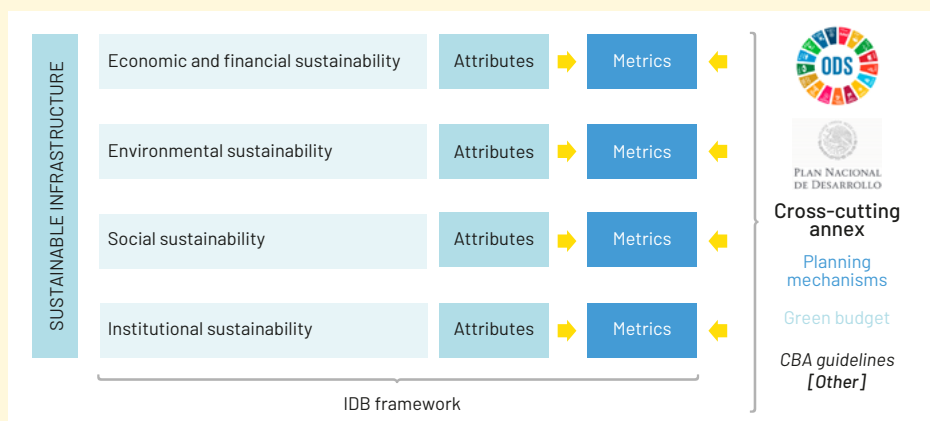
According to the economic strategy set out in the General Economic Policy Criteria 2019 (Centro de Estudios de las Finanzas Públicas, 2018), the Mexican government seeks to (i) increase investment spending on infrastructure, thus encouraging growth and productivity; (ii) achieve greater savings from the improved allocation of resources; (iii) improve efficiency and investment returns on factors of production while promoting peace and reducing violence and corruption; and (iv) promote the development of human capital among young people. Several of these objectives are consistent with the National Development Plan 2019-24, according to which the public sector will promote job creation through sector programs, regional projects, and infrastructure works, among other things. The commitment to sustainability and reducing the potential impacts of infrastructure investments will help the country to fulfill international conventions such as the Paris Agreement and the United Nations 2030 Agenda for Sustainable Development.

Given that infrastructure investments are one of the priority objectives, the government intends to encourage the construction of sustainable infrastructure to promote balanced regional development, sustainable urban development, and logistical integration and increased interconnectivity. The construction sector has become the third most important economic activity in the country in recent years, with the greatest capacity to create jobs. According to the Mexican Chamber of the Construction Industry (Méndez, 2019), the construction industry contributed a significant 6.5 percent of GDP to the national economy in 2019. Likewise, for every 10 direct jobs, 5 indirect jobs were generated in economic sectors related to construction, playing an important role in the country's economy.

Due to the strategic importance of infrastructure investment at the national level and the focus on promoting sustainable development, the Ministry of Finance and Public Credit is in the process of adopting a new project prioritization methodology and developing a taxonomy of sustainability indicators for investment programs and projects. This tool will help to integrate climate change action into analysis of the project portfolio, ensuring that projects yield social returns and that sustainable public investment is prioritized at the federal level within the framework of the national public investment system.

The sustainability indicators are being incorporated into the national investment system as part of the 2021 programming and prioritization exercise, and they must be used by all agencies requiring a record or code in the federal investment portfolio and budget. The mandatory use of standardized sustainability criteria in cost-benefit analyses will help prioritize projects with the greatest social, environmental, and economic impact for the country. Given current circumstances in Mexico, with limited fiscal space and an economic slowdown caused by COVID-19, it will be important to prioritize projects that support sustainable economic recovery, creating jobs and leading the transition to an inclusive, low-carbon, and resilient economy. The following table summarizes the taxonomy of indicators that must be used in the case of the Ministry of Finance and Public Credit.

Taxonomy of Sustainability Indicators for Mexico's Ministry of Finance and Public Credit



Source: Authors' elaboration.

In summary, the transition to sustainable infrastructure will become increasingly important for all Latin American and Caribbean countries and will require the strengthening of institutional and financial capabilities to develop projects that help to reduce carbon emissions. Achieving the SDGs and Paris Agreement goals will therefore require major reforms to strategic planning and investment systems, as this is the only way to improve the allocative efficiency of investments and close gaps by making better use of existing resources. Finance and planning ministries will play a central role in these tasks as the main parties responsible for the financing and quality of sustainable infrastructure spending.

Section 2. Green Buildings in the Public Sector

ESPERANZA GONZÁLEZ-MAHECHA

The use of energy efficiency measures in government administrative, health, and education buildings represents an important opportunity. Not only does it help to reduce the costs associated with operating and maintaining buildings, thus freeing up resources for other priorities, but it also allows governments to gain credibility in their actions by providing citizens with examples of best practices. Similarly, given the size of the subsector, any generalized measure adopted in some countries will have implications for other markets. The implementation of energy efficiency measures in public sector buildings is also consistent with international commitments made by the countries, including the Paris Agreement.

Generally speaking, green buildings make more efficient use of resources such as energy and water, and they use building materials with less embodied energy during their life cycle. Green building initiatives have advanced significantly in recent years, mainly due to the use of energy efficiency measures. In Latin America and the Caribbean, the building and construction sector was responsible for 22 percent of total energy consumption in 2018, behind only the industrial and transport sectors. In terms of electricity consumption, the sector is the largest consumer, accounting for 52 percent of total consumption (Latin American Energy Organization, 2020). Considering the challenge that the world faces in terms of reducing emissions to keep temperature increases below 2°C, more efficient energy use is one of the measures that must be adopted.

Efficiency incentive policies in buildings can create significant fiscal benefits by reducing spending and increasing revenue. Spending-related benefits include (i) reduced public sector operating costs and a decrease in resources allocated to energy consumption subsidies due to the implementation of energy efficiency measures in government buildings and the most vulnerable residential segments, respectively; and (ii) a reduction in the need for energy supply infrastructure investments due to lower growth in energy consumption. On the revenue side, the following benefits are of note: (i) retrofitting of the building stock to improve efficiency boosts property tax revenues by increasing property values and also generates employment in the construction sector (crucial in a context of an economic recovery); and (ii) building modernization helps to develop a market for more efficient goods and services, boosting revenue from taxes on value added and associated professional services.

An example is the European Union, where budget savings from energy efficiency policies in buildings were estimated at between US\$41 billion and US\$55 billion, rising to US\$91 billion to US\$175 billion once tax revenues and reduced unemployment payments were included (International Energy Agency, 2019b).

National and subnational governments in the region have recognized the advantages of energy efficiency in government buildings. At the national level, for example, Argentina's National Program for the Rational and Efficient Use of Energy in Public Buildings included a series of measures to be implemented in the short, medium and long term. Brazil, meanwhile, has mandated the use of the National Energy Conservation Label in federal public buildings. Some local governments, such as the city of Bogota in Colombia, have incorporated best practices into building life cycle regulations (design, construction, operation), as well as the use of renewable energy in public facilities (Box 7).

Box 7. Three Country Cases: Argentina, Brazil, and Colombia

Argentina's Program for the Rational and Efficient Use of Energy in Public Buildings (Ministerio de Energía y Minería, n.d.)

Decree 140 of 2007 declares the rational and efficient use of energy to be a priority of national interest. It makes implementation of the program mandatory in buildings belonging to all national executive branch agencies, and it invites the legislative and judicial branches, provinces, Autonomous City of Buenos Aires, and municipios to join the initiative. Annex II of the decree deals with energy in public buildings and lists the actions that must be implemented within different time frames. In the short term, it establishes an energy efficiency system for lighting and mandates training for officials in best practices for energy use. In the medium and long term, it assigns responsibilities for implementing the program and includes energy efficiency criteria in goods and services procurement, among other things. The Ministry of Energy and Mining's Undersecretariat for Energy Saving and Efficiency is currently in charge of this program.

Brazil's National Energy Conservation Label (ENCE) in Federal Public Buildings (Governo Federal do Brasil, 2014)

Rule No. 2 of June 4, 2014, issued by the Secretary of Logistics and Information Technology in the Ministry of Planning, Budget, and Management, establishes rules governing the purchase or lease of energy-consuming equipment by the federal administration, as well as use of the ENCE in projects to build or retrofit federal public buildings. Article 5 of the regulation states that new federal public building projects must be developed to ENCE Class A project standards, while retrofitting work must obtain the ENCE Class A label for individual lighting and air conditioning systems.

Bogota's Ecurbanism and Sustainable Construction Policy

(Alcaldía Mayor de Bogotá, 2014)

Bogota's Ecurbanism and Sustainable Construction Policy was adopted in 2014 through District Decree 566 of 2014, which aims to transform Bogota into a resilient territory that adapts to and mitigates climate change. The actions adopted relate to new practices in building life cycles. This covers design, construction, and operation processes that lower maintenance and energy consumption, promote the use of renewable energies, and reduce emissions and waste to the greatest possible extent. The technical documents for policy implementation include the parameters for selecting materials for sustainable buildings, with priority placed on the use of materials that are regional, recycled, rapidly renewable, or certified with a green seal, among other requirements. Implementation of the policy is headed by the District Planning Department, with the support of the District Secretariats for Environment and Habitat. Decree 631 of 2015 introduces an incentive scheme for new buildings, including district education and health facilities, that adopt ecurbanism and sustainable construction measures. Incentives are also provided for efficient lighting and the use of water conservation fixtures.

There are three types of challenges to introducing energy efficiency measures in public buildings:

- 1 Technical:** Challenges in this area relate to institutional capacities and evidence of the effectiveness of interventions. (a) Ensure that public building managers are aware of the gap between energy consumed in the facility they manage and the level that could be achieved by implementing specific conservation measures. A lack of awareness of these gaps is due to an absence of methods for monitoring energy and water consumption. (b) Demonstrate that there are technologies, methods, and behaviors that can be implemented to substantially reduce energy consumption or replace it with less expensive and/or less polluting sources.
- 2 Budgetary:** Public entities often face difficulties in obtaining financing in this area, as all investments go through prioritization exercises that generally omit investments in energy efficiency. To overcome this, governments need to move away from an emphasis on minimum purchase costs by adopting a life cycle perspective.
- 3 Legal and institutional:** Regulations tend to focus only on the residential and industrial sectors, for example, and do not extend to public buildings. A program to implement energy efficiency measures in public buildings should evaluate the following points: a) a coordination unit; b) a public buildings database; c) development of a legal tool to encourage implementation of

the measures, including definition of a scope of action, targets and periods for generating savings, etc.; d) training for maintenance staff; e) education for officials working in public facilities; and f) purchases that take energy efficiency into account (e.g., more efficient light fixtures).

Chapter 6 addresses how financial strategies for climate change can help to coordinate national climate objectives with investment priorities, attract capital, enhance the availability of financial instruments, and align public and private financing.

Chapter 6

Financial Strategies for Climate Change and the Financial System Response to Climate Change Risks

To meet climate and sustainable development goals, finance and planning ministries must effectively assess and determine how to attract capital while also aligning financing with the investments required on the ground to reap the benefits of the transition.

As highlighted in Chapter 1, when addressing this transition challenge it is critical to plan beyond an immediate investment portfolio. In other words, it is important to consider the major transformations needed to align public and private finances in support of net zero emissions and climate change resilient development. According to a special report prepared by the Intergovernmental Panel on Climate Change (Masson-Delmotte et al., 2018), the scale and pace at which country targets need to be achieved and climate change stabilized requires an approach that encompasses interventions across all economic sectors, driving investments toward zero emission and climate-resilient solutions. At the same time, this transition entails risks and opportunities for the financial sector that need to be mitigated and leveraged, respectively, with a view to fostering sustainable economic growth.

In this context, countries can benefit from the strategic identification of investment priorities, financing approaches, and project portfolios, all of which should promote access to funding through the mobilization of multiple financing sources. Given that the scale of investment required is beyond the reach of government budgets alone, change must come from both the public and private sectors. This will not happen by itself, however. Signaling is required to boost demand in the real economy for low-emission, climate-resilient investment financing and increase the supply of climate-compatible finance (Thwaites et al., 2018).

Section 1. Financial Strategies for Climate Change: From Defining NDC/LTS Goals to Implementing Them

MARCELA JARAMILLO

Financial strategies for the transition can help countries to coordinate the climate goals and measures set out in national plans (nationally determined contributions (NDCs) and long-term strategies (LTS) with investment priorities and roadmaps for action. This, in turn, can facilitate coordination between different areas of government and clarify options for managing potentially conflicting objectives, while also making effective use of limited public resources (both domestic and international) and identifying options for attracting private capital. Examples include identifying financial instruments, policy, and governance approaches that enable investment in renewable energy systems, the expansion of electric public transportation infrastructure, energy efficiency, green buildings, low-carbon agricultural practices, reforestation, and nature-based adaptation solutions.

A financing strategy is essentially the outcome of a process in which a country determines what needs to be financed, how it will be financed, who will finance it, and how to measure compliance with NDC and LTS targets over time (Naidoo et al., 2014), all taking into account social, economic, and environmental well-being.

Developing a financial strategy could allow countries to achieve the level of granularity required to, for example:

- › **Identify and articulate the roles of different decision makers** in the government and financial sector to stimulate discussion and collaboration with the institutions that traditionally lead the climate agenda, such as environment ministries and the institutions responsible for planning public finances (e.g., the finance, economy, and planning ministries and the central bank).
- › **Provide greater transparency and signals** to the private sector regarding the focus of available public resources.
- › **Provide the framework for stakeholder participation**, including defining the role of the financial sector in implementation of the NDCs and LTS, as well as the joint design of incentives.
- › **Facilitate consistent and effective access to international resources**, for example, financing from multilateral development banks, the Green Climate Fund, etc.

- › **Introduce climate risk management** into national investments and planning, for example in infrastructure.
- › **Expand the role of institutional investors** with a view to leveraging and expanding long-term financing.

In general, governments can play three main roles in mobilizing the investments required to achieve climate and sustainability goals: (i) creating an enabling environment (policies and regulations) for consistent long-term investments; (ii) using public budgets and public and private investments effectively, including through dedicated funds and/or financial intermediaries; and (iii) customizing the application of financial instruments to mitigate risk (Green Growth Best Practices, 2014).

1.1 Features of a Climate Change Financial Strategy

In light of the above, a comprehensive financial strategy should have four central elements:

- 1 Investment plan:** This plan should guide and report on the mobilization of resources in the short and medium term. For the successful delivery of outcomes, this type of plan should provide clarity regarding investment priorities (type and size of investments) and the costs and levels of technological requirements, while identifying the necessary public policies and processes, institutional tools, and know-how. Financing options and preferences should also be covered, including the desired roles of public finance, the private sector, and financial intermediaries.

The plan should seek to determine the flow of projects and facilitate the steps needed to identify and select projects aligned with the country's LTS or NDC targets. Lastly, it should define a roadmap for implementation that includes milestones and key timelines (which policies, programs, and projects, and by when). To ensure that an investment plan is reasonable in light of the implementation of the NDCs or LTS, it must be developed with the participation of the relevant public and private financial stakeholders, with special emphasis on finance and planning ministries.

- 2 Actions to align public policies and finances:** These include the analysis and definition of comprehensive policies and regulations that establish a stable and coherent framework. These should provide adequate price signals, eliminate

market barriers, define mandates and performance standards, align the triggers for economic growth, and support projects in new markets (Sullivan, 2011). In addition to the immediate investment portfolio, a framework is required that is conducive to sustainable development and climate objectives, including consistency between public investment programs, medium-term spending frameworks, and fiscal responsibility rules.

While many regulatory and policy updates will be required at the sector level (e.g., energy reforms, urban planning regulations, updating public transport concessions, etc.), finance and planning ministries will play a key role in facilitating coordination among government institutions.

A key role for finance ministries will be to identify opportunities to improve decision making on public investments that respond to the country's long-term goals. They will also need to consider integrating climate and sustainability criteria into central economic and fiscal policies and across all public financial management systems.

3 Actions to align the financial sector: The scale of resources needed to achieve the objectives of the Paris Agreement exceeds public financial capacities (see Chapters 1, 2, and 5). It will therefore be essential to work with the private financial sector to align financial resources with countries' long-term climate and sustainable development objectives. Sustained financing also needs to be ensured for countries' climate investment plans and the overall transition to appropriate zero-carbon and climate resilient development.

There are two main dimensions that need to be developed in the context of the financial sector and its regulation:

- › **Risk management:** The financial sector should analyze, include, consider, and disclose information on climate-related risks and their socioenvironmental impacts. It should also examine activity in the capital markets, evaluating their potential use with reference to international trends in this area.
- › **Alignment of financial policies and products:** Consideration should be given to where and how regulators and the financial sector and capital markets can support and promote investments that help a country to meet the goals of the Paris Agreement and the SDGs.

4

Robust decision making based on a joint design process: Governments will be more successful in designing and implementing policy and financing measures when these are integrated with national development programs and fiscal sustainability frameworks. The same is the case with respect to the private sector: these measures should be developed in consultation with the business and financial communities and adapted to address local investment risks and market constraints (Green Growth Best Practices, 2014). To demonstrate transparency and build confidence regarding the direction that investments in the country will take, the overall vision, objectives, and priorities should be established in close consultation with all relevant public institutions and national stakeholders, including the private sector. A financial strategy must also stipulate governance arrangements, with clear responsibilities and a permanent framework for dialogue, dissemination, and decision making with stakeholders (Box 8).

Box 8. Financial Strategy for Climate Change in Chile

Chile's Financial Strategy for Climate Change was developed by the Ministry of Finance and presented by Minister Ignacio Briones at the United Nations Conference on Climate Change. The strategy is a commitment made by Chile in its first NDC and reconfirmed in the second in 2020, and it is expected to be part of a new framework law on climate change (currently under discussion in the Senate). The objective of the strategy is to coordinate actions to accelerate the flow of resources in support of a resilient and carbon neutral economy by 2050.

The strategy determines **a framework for action organized into three pillars** that provide a coherent umbrella for several of Chile's existing initiatives and provide clarity on priority areas for effort. It sets out **objectives, progress already achieved, and specific actions to be carried out in the short term** for each of the three pillars, making it a pragmatic document focused on managing actions.

Example 1. Generating information, data, and analysis to mobilize capital flows consistent with Chile's climate objectives, economic growth priorities, fiscal responsibility, and sustainable development with a long-term vision. The goal is to generate robust evidence to inform decision making, as well as periodically evaluate and refine the instruments that make up the country's institutional framework for climate finance.

a) Key advances: Establishment of the institutional framework for coordinating work with the Green Climate Fund and progress on a methodology to measure public and private spending on climate change.

b) Example of short-term measures: Identify investment needs and establish a roadmap to help implement the long-term sustainable development and climate objectives defined under the NDC and the vision for carbon neutrality.

Example 2. Promoting the design and implementation of green financial instruments and fostering markets through cross-sector collaboration. This includes mobilizing different sources of financing for capacity building and knowledge development (including multilateral sources).

a) Key advances: Creation and implementation of the green tax and issuance of the first two sovereign green bonds, for a total of US\$2.377 billion.

b) Example of medium-term measures: Evaluate and ultimately execute new sovereign green bond issues.

Example 3. Strengthening the local financial sector's understanding, capabilities, and action on climate change risks and opportunities, in line with international standards and best practices.

a) Key advances: Creation of the Public-Private Roundtable on Green Finance with the objective of determining a joint work agenda for the government, regulators, and financial market institutions to incorporate the risks and opportunities of climate change.

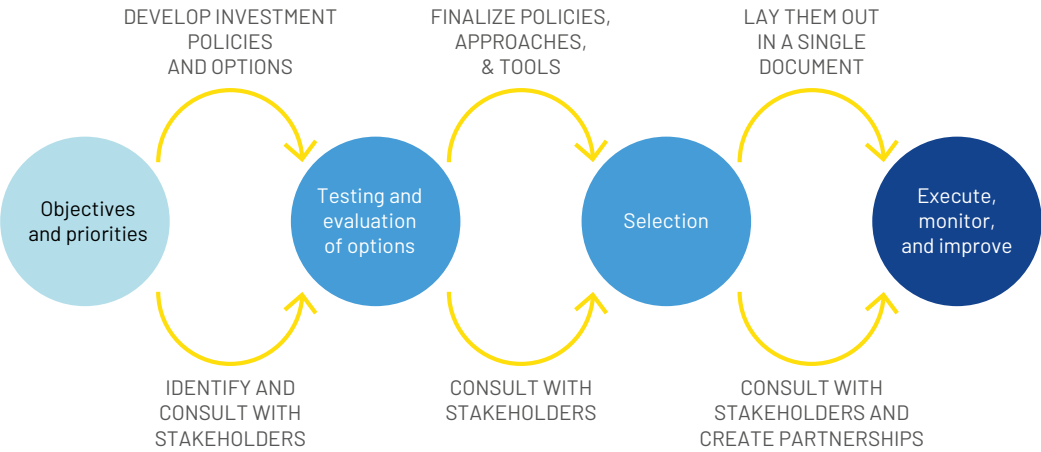
b) Example of short-term measures: Prepare a Green Finance Roadmap 2020+, as well as an institutional framework to facilitate implementation of the Green Agreement and generate synergies as needed.

The strategy includes a **governance framework** that assigns responsibility for the actions to be undertaken in the strategy to the Ministry of Finance, with the support of the Ministry of the Environment, sector ministries, and financial regulators, among others. Likewise, the strategy recognizes the need for it to be a living, iterative document that reflects developments in the national context over time. It will therefore be updated in 2021 to incorporate the multiple policies and initiatives being developed, and from 2025 onwards it will be updated every 5 years as part of the design of new NDCs.

Chile's Financial Strategy for Climate Change is an example of the leadership role that finance ministries can play within their respective mandates. It sets out a clear framework that can contain macroeconomic and fiscal policies, public financial management, and financial regulation, as well as work required with other stakeholders, such as sector ministries, the central bank, and supervisors.

It should be noted that the process of developing the core elements outlined here is not a linear one; rather, it is an iterative process of stakeholder engagement and analysis that helps to build a sound financial strategy (Naidoo et al., 2014). Furthermore, the way these four elements are defined can vary from one country to another, as financial strategies are specific to each country and must respond to their particular context.

Figure 9. Process for Developing a Financial Strategy for Climate Action
(adapted from E3G)



Source: Naidoo et al. (2014).

Section 2. Financial Systems and the Risks Posed by Climate Change

MATÍAS GALLARDO AND GIANLEO FRISARI

In September 2015, Mark Carney, then Governor of the Bank of England, officially placed climate change-related risks on the agenda of financial regulators and supervisors (Carney, 2015). Later that year, the Financial Stability Board launched the Task Force on Climate-Related Financial Disclosure (TCFD) with the goal of assisting the financial system (banks, investors, investment companies, insurance companies, and issuers of bonds and stocks) to better understand the impact of climate change on financial markets. In June 2017, the TCFD published its recommendations, which establish an important framework for the identification, classification, management, and disclosure of climate risks in financial markets (TCFD, 2017). That same year, eight central banks and financial supervisors created the Network of Central Banks and Supervisors for Greening the Financial System (NGFS), with the aim of generating, sharing, and disseminating knowledge on the impacts of climate change on financial markets, as well as understanding the role of regulation and supervision and the measures required. Today, the network has more than 66 members and 13 observers. Only 7 institutions from Latin America and the Caribbean belong to the Network, representing 5 countries. In the NGFS's first report (October 2018), the members concluded that climate risks

are a source of financial risk, and therefore fall under the regulatory and supervisory mandates of central banks and financial system supervisory authorities.

2.1 Progress in Latin America and the Caribbean

In general, financial regulators and supervisors in Latin America and the Caribbean have not yet explicitly included or addressed climate-related risks in binding financial sector regulations and/or supervisory measures. This implies that there is significant work to be done for the region's financial sector to develop effective and comprehensive mechanisms to identify, evaluate, manage, and disclose these risks within existing supervisory and regulatory frameworks. At the same time, a lack of clarity prevails in both the taxonomy of such risks and the tools needed to manage them.

Despite the differences between climate-related risks and environmental risks (the former focus on the impacts of the environment and environmental changes on the project, while the latter relate to the impact of the project on the environment and its surroundings, e.g., pollution), the management of climate-related risks in financial markets in Latin America and the Caribbean can build on and leverage existing environmental and social governance (ESG) risk management practices. These include criteria and standards, agreements and protocols at the industry level, and binding regulations. Additionally, given that the concepts of climate-related risks and the tools for managing them are new to the financial industry and its regulators, it is important that efforts in the region be based on interaction with international initiatives such as the TCFD, the NGFS, and others.¹⁶

As mentioned above, countries in the region have not yet explicitly included or addressed climate-related risks in binding financial sector regulations and/or supervisory measures. However, several countries already have regulatory and self-regulatory measures for environmental and social risks that can be considered a first step toward the more explicit regulation of climate-related risks. Based on these regulatory and supervisory efforts, countries can be classified into three main groups: (i) those with ESG risk regulations, (ii) those in which supervisory measures have been implemented or initiated, and (iii) those in which the private sector has implemented or led practices and efforts (self-regulation) (see Figure 10).

16 The Bank for International Settlements and the International Organization of Securities Commissions have also created collaborative initiatives for the banking system and the securities markets, respectively, on the topic of sustainable finance.

Figure 10. Regulatory and Supervisory Initiatives for Climate-Related Risks in Latin America’s Financial System

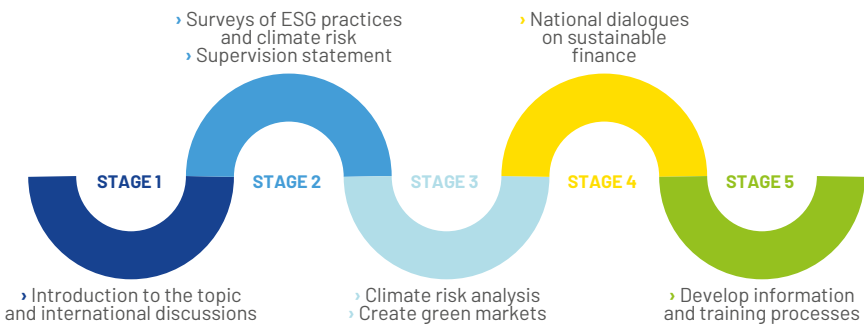


Source: Frisari et al. (2019).

2.2 Sustainable Finance Roadmaps

Governments and regulators may consider a variety of actions for promoting financial sector participation in the climate resilient economy and the transition to net zero emissions, including training for financial institutions, analysis and diagnostics of the sector and its level of preparedness, and even quantitative analysis of the scale of risk and sector exposure. These actions are not necessarily sequential or linear: they can occur in any order depending on the country and context. A phased approach is shown below that could form the basis for a sustainable finance roadmap (Figure 11).

Figure 11. Sustainable Finance Roadmap



Source: Authors’ elaboration.

To move forward and help close knowledge gaps, it is important that national stakeholders are aware of and participate in international forums on sustainable finance (Stage 1). Initiatives such as the NGFS, TCFD, and the various financial sector sustainability principles are a good starting point. In the next stage (Stage 2), a broader understanding should be developed of the topic and of existing practices at the country level. In this respect, surveys on ESG and climate risk practices have proven efficient tools for identifying information gaps, the relevance of particular topics, and opportunities for local financial

institutions to collaborate. Countries such as Chile, Colombia, and Mexico have carried out such surveys using different measures and approaches. These surveys can in turn trigger a series of actions or activities such as roadmaps, dialogue processes, or declarations, depending on the circumstances in each country.

In the case of Chile, a survey conducted by the Ministry of Finance served as an input into the Green Agreement process and the Joint Declaration on Climate Change issued by the authorities in 2019 (Ministerio de Hacienda de Chile, 2019b). In Colombia, the Financial Superintendency issued a supervision roadmap based on the findings from its survey (Superintendencia Financiera de Colombia, 2019). Mexico's central bank conducted a very comprehensive survey of financial institutions that yielded clear recommendations for a new Sustainable Finance Committee established by the Council for Financial Sector Stability (Banco de México, 2020). All of these actions, which are generally more qualitative in nature, are especially important for addressing the issues and raising awareness of the risks. In the case of supervision statements, these are important signals of transparency to financial institutions regarding potential developments in regulation and supervision. These actions can be followed by more quantitative efforts, such as specific assessments of climate risks at the market or sector-specific level (Stage 3).

Despite examples of such efforts in European countries—such as the analysis of physical and transition risks published by the Central Bank of the Netherlands (Regelink et al., 2017) and the analysis of scenarios and stress tests by the Bank of England (2019)—none of the countries in the region have so far carried out a comprehensive climate risk assessment. There are some initial commitments from the Central Bank



Countries are at different stages in the process and there is no single formula for promoting the adoption of sustainable practices in the financial sector.

of Costa Rica, however, concerning the implications of the El Niño phenomenon for the country's financial sector (León, 2017), and from the Federation of Colombian Insurers, with a diagnosis of transition risks for the country's insurers (pending publication).

As part of the process of carrying out these surveys and following up on their results, national dialogues are established in the countries among regulators, supervisors, and representatives of the financial sector (Stage 4). These dialogues take different forms depending on the context and have value both as a dialogue between the public and the private sectors and as a means of fostering discussion within governments. In the case of Chile, the Green Finance Roundtable was led by the Ministry of Finance and comprised of all the country's financial regulators and supervisors, as well as unions (Ministerio de Hacienda de Chile, 2019a). In the rest of the region, ad hoc dialogues have taken place through protocols (for example, the Green Protocol in Colombia) or existing sector associations (such as the Mexican Banking Association and Green Finance Consultative Council in Mexico and the Brazilian Federation of Banks). Another example of this phase is the formation of a Sustainable Finance Committee in Mexico's Financial Stability Council, constituting a tool for institutional dialogue among financial regulators and supervisors in the country.

Lastly, Stage 5 may be executed alongside any of the previous stages. The key component to understanding progress is being able to measure it and having the ability to address issues. As countries acquire more knowledge and capacity on the subject, the kind of information, data, and capacities they require will become clearer.

Different countries have started at different stages and there is no single formula for promoting the adoption of sustainable financial practices within the sector. What is important is to establish a roadmap to assist the sector and its institutions to create awareness of the topic, build risk management capacities, and establish enabling conditions to take advantage of new opportunities. A smooth and successful transition will also require transparency and clarity in this roadmap, as well as continuous dialogue between regulators and the private sector and the development of instruments and policies based on consultation.

Section 3. Instruments for Financing the Transition to Zero Emissions: Sovereign Green Bonds

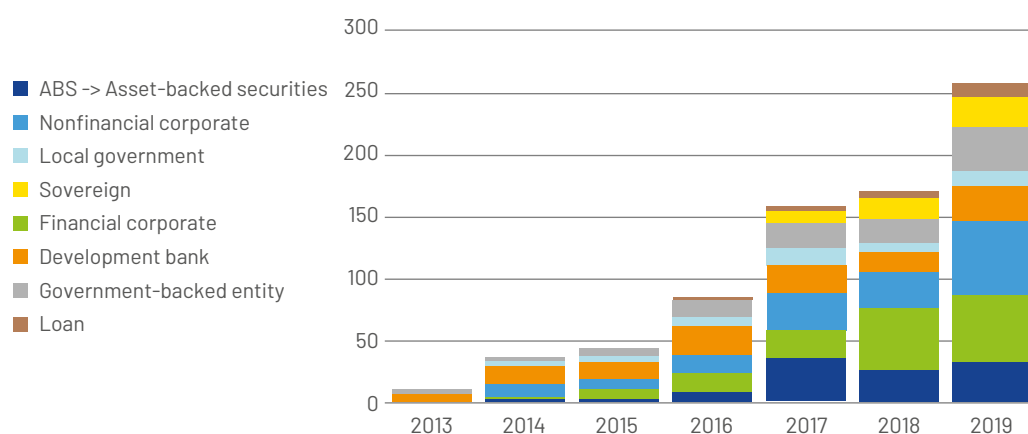
GIANLEO FRISARI

In addition to financial regulation and supervision measures, a transition to net zero emissions requires financial instruments that can leverage the new investment opportunities created by the realignment of economic systems.

ESG sustainable investment markets have grown very rapidly in recent years, from US\$13.3 trillion in 2012 to an estimated US\$30.7 trillion in 2018 (Global Sustainable Investment Alliance, 2019). In the case of capital markets, debt instruments to finance sustainable assets aligned with low emissions and/or climate resilience (green bonds) have evolved from a niche instrument piloted by development banks (first issued in 2007-08 by the World Bank and the European Investment Bank) into a useful investment instrument for companies, private financial institutions, and also public entities (including national and subnational governments).

Sovereign governments are new issuers in this market, with the first sovereign green bonds issued in Poland at the end of 2017 and France in early 2018. In little more than two years, however, sovereign green bonds have come to represent a significant portion of the market, with cumulative issuance of more than US\$50 billion by a dozen different countries. These have included both developed countries (e.g., Belgium, France, Ireland, and the Netherlands) and emerging countries (e.g., Chile, Fiji, Indonesia, and Nigeria) (Figure 12).

Figure 12. Global Green Bond Issuance (US\$ billion)



Source: Author's elaboration using data from the Climate Bonds Initiative (2020).

From a financial perspective, sovereign green bonds are traditional bonds in which resources are used exclusively to finance or refinance—either fully or in part—new or existing budget lines, programs, and projects deemed eligible based on green or social criteria. They are usually issued in the same way as conventional sovereign bonds (i.e., by government treasuries), with the important difference that they are accompanied by a reference framework and verification/certification by an independent third party, who validates the application of green bond principles.

According to the Green Bond Principles formulated by the International Capital Markets Association, the reference framework in a green bond program is a comprehensive document that includes the issuer's commitments under four main pillars:

- › Use of proceeds.
- › Selection mechanism for eligible expenditure.
- › Management of proceeds.
- › Monitoring and disclosure of impacts.

Over time, the market has also developed reference taxonomies (such as the Climate Bonds Initiative taxonomy [2020]), good practices, and guidelines that have significantly reduced green bond transaction costs and preparation times. For public issuers in Latin America, the IDB has a program to assist with the preparation of green and/or sustainable bonds (IDB, 2019b), with support for potential issuers through an assessment of appetite, preparation of the reference framework, selection of the portfolio to be financed, and, lastly, review by an independent third party.

The success of these instruments is due to the growing interest of investors in this market, as well as the clear benefits for sovereigns of issuing green bonds. There are four important issues to consider regarding green bonds (Box 9):

- › **Diversifying the investor base:** Especially for issuers in emerging countries, green sovereign bonds can be a key instrument to attract thematic, sustainable investors (ESG investors), who are typically unable to buy conventional sovereign bonds or identify significant volumes of sustainable private investment opportunities in emerging countries.
- › **Mobilizing capital for sustainable public investment:** The funds raised through a green bond issue must be used to finance green public spending (with eligibility determined by the bond's reference framework).¹⁷ This creates a direct link

17 Earmarking is used so that the proceeds enter the government's general account with the commitment that an equivalent amount will be disbursed within a defined time period for public green investments.

between the appetite for sustainable investment in capital markets and the opportunities for sovereign entities to prioritize sustainable public projects and expenditures that also help them meet their climate commitments (for example, their NDCs).

- › **Creating national sustainable financial markets:** Due to their size and importance, sovereign issuers have the potential to be role models for other national public and private issuers, who can take advantage of the interest created in the market and the identification of eligible sectors in the sovereign reference framework.
- › **Creating transparency in the management of funds:** According to the Green Bond Principles, the issuer uses the reference framework to set out eligible expense categories, fund management mechanisms, and result and impact indicators for activities financed by the green bonds. This level of transparency, higher than for conventional sovereign bonds, can generate confidence in an emerging market and mitigate risk perceptions.

Box 9. Chile Issues the First Sovereign Green Bond in the Americas

Chile's sovereign green bonds, issued in June 2019, were the first to be issued in the Americas. The country published its framework in May 2019, securing certification under the Climate Bonds Initiative and independent verification by Vigeo Eiris in preparation for the first issues (Ministerio de Hacienda de Chile, 2019): US\$1.418 billion on 17 June and €861 million on 25 June. Chile returned to the market in 2020 for additional green bond issues under the same reference framework, raising a total of more than US\$6.2 billion in the capital market.

Chile's sovereign green bonds are in keeping with various commitments and climate policies adopted by the country. They are seen as a key financing instrument for achieving the emission reduction commitments in its NDC, as well as one of the core instruments in the country's National Climate Change Financing Strategy.

Consistent with international best practices, Chile's sovereign green bond framework identifies six sectors eligible for funding—clean transportation, energy efficiency, renewable energy, natural resources and land use, water management, and green buildings— and lists a number of results and impact indicators for each one. Finance ministries could strengthen public investment management by incorporating sustainability criteria into assessment and prioritization processes (see Chapter 5), making it easier for them to identify eligible sustainable investments as part of green bond frameworks.

Chile's bond issues can be considered highly successful for several reasons:

Investor interest: The issues were very well received in the market, with high levels of oversubscription and a very favorable price for the issuer. The 2019 and 2020 issues achieved the lowest interest rates ever paid by Chile on its long-term bonds.

Investor diversification: Most of the bonds were bought by European and North American ESG investors (55 percent of the total), who were most likely buying their first sovereign bond from Chile.

Interministerial dialogue: Preparation of the green bond allowed a transparent dialogue between the Ministry of Finance and the sector ministries (particularly transportation, environment, public works and energy). It provided clarity regarding project prioritization and the financing measures for many sector policies (e.g., the National Electromobility Strategy, Energy Sector Mitigation Plan, and Mitigation and Adaptation Plan for Infrastructure Services).

Chapter 7

Sustainable Economic Stimulus Strategies in the Wake of the Covid-19 Pandemic

HUÁSCAR EGUINO, MARCIA BONILLA-ROTH, ALOISIO LOPES, AND RAÚL DELGADO

One of the consequences of the COVID-19 pandemic has been the reduction in greenhouse gas emissions during 2020. This is a transitory effect, however, and the net impact of this reduction will be determined by future spending and investment decisions. The characteristics of the economic recovery packages will determine whether investments remain brown—i.e., dependent on fossil fuels—or become green, promoting a greater reduction in the greenhouse gas emissions generated by economic activity. Accordingly, it is important that economic recovery packages include actions to address climate change, while also contributing to other priority objectives such as economic growth, poverty reduction, and job creation.

The characteristics of recovery packages in Latin America and the Caribbean will differ depending on the macroeconomic conditions and fiscal space in each country, as well as their institutional capacity to incorporate climate actions into development strategies and fiscal policy. This chapter presents a series of reflections that it is hoped will serve as inputs for designing and implementing economic recovery packages. It begins by recognizing the complexity of the challenges and the need of countries in the region to boost economic growth, equity, and job creation while urgently addressing the risks associated with climate change.

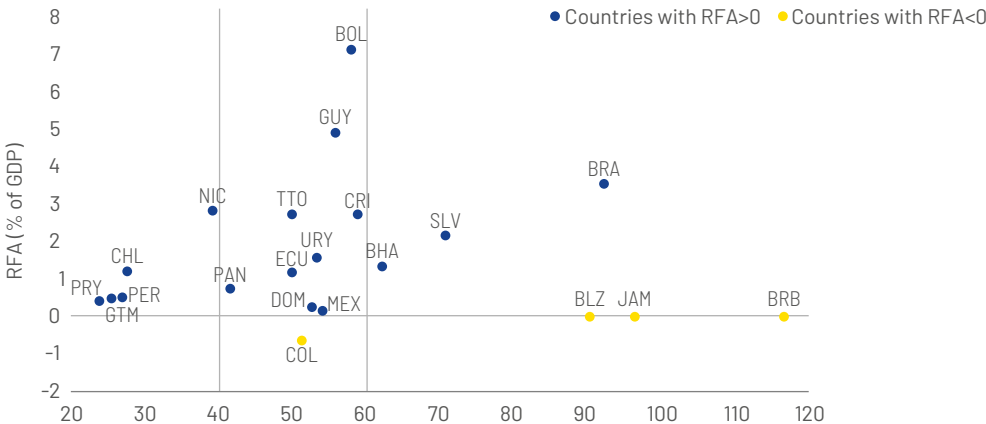
Section 1. Sustainable Economic Recovery in the Wake of the COVID-19 Pandemic

1.1 Investing for a Sustainable, Equitable, and Resilient Economic Recovery

Recent economic estimates indicate that GDP in Latin America and the Caribbean contracted by 7.4 percent during 2020: the largest decline in almost two centuries (Cavallo and Powell, 2021) and the largest of any region in the world. In addition to the emergency measures associated with the COVID-19 pandemic, governments will have to adopt significant fiscal measures to reactivate public investment and reverse the impacts on employment, human capital, and productivity (International Monetary Fund, 2021). In addition, there are two important trends: investments are lower than in other regions and are of limited efficiency (Izquierdo, Pessino, and Vuletin, 2018).

The economic impact of the pandemic has created pressure to increase public investment to accelerate the economic recovery and boost employment. However, deteriorating fiscal balances and rising debt mean that most countries in the region will have little fiscal space to increase investment (Pineda, Valencia, and Andrian, 2020) (Figure 13). Governments will therefore have to improve the quality of their projects by prioritizing sectors that generate employment, reduce inequality, support the transition toward the decarbonization of economies, and increase their climate change capabilities.

Figure 13. Required Fiscal Adjustment and Debt Levels in Latin America and the Caribbean (as a percentage of GDP)



Source: Latin American and Caribbean Macroeconomic Report 2020 (IDB, 2020b), IDB calculations based on FMI (2019).
Note: RFA = Required Fiscal Adjustment.

Two of the main measures for optimizing investment in response to the economic impacts of the pandemic are improvements in the strategic framework for identifying investments and the use of technical criteria to better prioritize the use of resources. With respect to the first, it is important that countries make use of their decarbonization and adaptation strategies or, if they do not yet have these, that they adhere to the principles that generally govern them. (See Chapter 1, Section 1.1, for the role that long-term strategies play as tools to help countries avoid investments that can trap them into high carbon-emission pathways and create stranded assets). Based on this reasoning and these principles, project selection criteria should be used to prioritize projects that contribute to decarbonization, climate resilience, job creation, and equity (Saget et al., 2020). As mentioned earlier, this involves avoiding fossil fuel-intensive investments (see Chapters 2, 4, and 6) and reducing the risk that countries will be trapped with stranded assets that would generate higher costs for their economies (see Chapter 2, Section 3). Accordingly, it is important that investment be considered in the following sectors in the post COVID-19 recovery phase, consistent with strategic frameworks for decarbonization and adaptation:

- › **Renewable energy:** Renewable energy is more labor-intensive than fossil fuel-based industries, and investments in this sector—together with smart energy grids designed to meet large-scale demand—therefore support decarbonization and reduce air pollution while also generating employment (International Labour Organization, 2012). Indeed, an econometric study of government spending on renewable energy shows that it creates five more jobs per US\$1 million invested than spending on fossil fuels (McKinsey & Company, 2020). Additionally, renewable energy sources are becoming cheaper, as shown by recent experiences in Chile, Mexico, and Peru. According to data from the International Renewable Energy Agency, distribution companies in these countries purchase solar energy for as little as US\$0.03 per kilowatt hour, a lower price than for other energy sources (IRENA, 2020).
- › **Transportation:** Given its high dependence on fossil fuels, transportation is one of the four main sectors responsible for greenhouse gas emissions in Latin America and the Caribbean. Fortunately, the price of renewable energies is increasingly competitive, and it is estimated that by the middle of this decade the cost of electric vehicles will be similar to those with internal combustion engines—albeit with wide variations between regions (Bloomberg NEF, 2020). In a context of recovery measures, it is therefore essential to include investments that favor the electrification of transportation, expansion and efficient use of public transportation, and construction of bicycle and mass transit lanes,

among other things. As shown in the case of Costa Rica (see Box 10), this type of investment generates important economic benefits due to improvements in health and productivity, as well as accidents avoided.

Box 10. Costs and Benefits of the Decarbonization of Costa Rica's Transportation Sector

Costa Rica's Decarbonization Plan sets out ambitious goals for the transportation sector, including the electrification of 85 percent of the public fleet and 95 percent of the private fleet by 2050. Progress in the emissions reduction plan for the transportation sector progresses will yield significant benefits (Godinez et al., 2020):

- (i)** Reduced emissions, leading to health savings.
- (ii)** Reduced traffic congestion, resulting in productivity gains.
- (iii)** Fewer accidents due to a smaller private vehicle fleet.
- (iv)** Improvement of the trade balance due to lower fuel imports.

Implementation of the plan in the transportation sector will yield net benefits of US\$20.6 billion for the country by 2050 (about 35 percent of the country's current GDP), as follows:

- Lower net financial costs of US\$3 billion. While the capital costs of the transportation sector investments required to meet plan objectives are US\$26.7 billion higher in the period to 2050, this will be more than offset by lower operating costs of US\$29.7 billion.
- Net economic benefits of US\$17.6 billion. These benefits flow from improvements in health and productivity, as well as accidents avoided.

- › **Digital infrastructure:** The accelerated deployment of high-speed digital infrastructure has multiple economic and social benefits, particularly in periurban, rural, and disadvantaged regions. It also supports broader decarbonization goals—for example, by reducing the demand for population travel or commuting. Work from home and video conferencing will remain at high levels after the pandemic crisis, and this type of investment is therefore expected to accelerate strongly, generating significant economic benefits. In the case of government services, digital procedures are faster and reduce costs for both the government and citizens by lowering the duration and number of trips to government offices. The costs of digital transactions are 1.5 percent to 5 percent of those associated with in-person transactions. Completing an in-person transaction takes 5.4 hours on average and,

in 25 percent of cases, requires three interactions or more. Digital procedures are 74 percent faster than in-person ones (Roseth, Reyes, and Santiso, 2018).

- › **Land use planning:** Investments in urban infrastructure should be prioritized using land use plans that optimize the benefits of higher density and economic productivity (geographic concentration of companies and increased density in employment and trade chains). These investments minimize externalities such as congestion, carbon and pollutant emissions, and exposure to the effects of climate change. The spatial organization of cities influences energy consumption and carbon emissions from transportation and construction. According to the OECD (2010), for example, Japan's urban areas are five times denser than those of Canada, and per capita energy consumption is 40 percent lower. In other words, land use planning helps to (i) optimize investments in mass transit and non-motorized transportation infrastructure; (ii) improve the location of housing, infrastructure, and services; and (iii) facilitate conservation and better risk management in the event of natural disasters, among other things.

- › **Energy and water efficiency of buildings and housing:** Investments to improve the energy and water efficiency of buildings and housing yield multiple benefits because they are labor-intensive, reduce energy costs, and lower emissions. This type of investment is particularly important for the public sector, which could reduce operating and maintenance costs by certifying government building compliance with energy and water efficiency standards. It is also important to invest in the conversion and retrofitting of buildings to improve their functionality and achieve more efficient resource use. The building and construction sector was responsible for 22 percent of total energy consumption and 52 percent of electricity consumption in Latin America and the Caribbean in 2018. In Brazil, where this consumption grew by 1.6 percent per year between 2000 and 2016, the adoption of energy efficiency measures would curtail consumption growth by 30 percent by 2050 (see González-Mahecha et al., 2019)(Section 3, Chapter 5).



***Accelerated deployment
of high-speed digital
infrastructure has multiple
economic and social benefits
and also supports broader
decarbonization goals.***

- › **Solid waste:** Integrated solid waste management strategies can also help save resources, generate jobs, and boost the circular economy. Many cities in the region have demonstrated the multiple benefits of solid waste reuse and recycling. Waste clean-up programs, including the decontamination of soil, waterways, and oceans, also offer opportunities for job creation and improved quality of life.
- › **Natural infrastructure:** In several countries in the region, deforestation and land degradation are among the main causes of food insecurity and poverty, as well as carbon emissions and loss of biodiversity. Investments in nature-based solutions—such as reforestation, watershed and coastal ecosystem restoration, and the creation of ecological corridors—help to improve water reserves and water supply, flood and landslide control, biodiversity conservation, and carbon retention (Cavallo, Powell, and Serebrisky, 2020). These investments can be implemented rapidly, are low cost with high employment generation capacity, and are suitable for a context of urban expansion, environmental degradation, and growing water demand. Likewise, it is important to invest in drainage and sewerage systems that are resilient to changes in rainfall patterns.
- › **Food safety:** The pandemic could lead to increased food insecurity in the region, due to factors such as loss of income, increased price volatility, and disruptions in food production and the food supply chain. Investments in programs to ensure sustainable production, improvements in logistics chains, and food availability can help to reduce the impact of the pandemic on the most vulnerable populations while generating employment.
- › **Infrastructure for natural disasters:** Latin American and Caribbean countries are particularly vulnerable to the impacts of an unpredictable and changing climate, in the form of significant economic damage and human losses. However, there is evidence that climate-resilient investments not only help to avoid or minimize future damages, but can also generate benefits that exceed costs by a ratio of as much as 10:1 (Global Commission on Adaptation, 2019). Likewise, returns on investments to protect against disaster risks exceed US\$4 of avoided losses for US\$1 invested (Kull, Mechler, and Hochrainer-Stigler, 2013; Mechler, 2016; MMC, 2015; Moench, Mechler, and Stapleton, 2007; United Nations Office for Disaster Risk Reduction, 2011).

It is important to note that in order to boost these investments, governments need to improve the strategic frameworks used to identify green investments and apply technical criteria to achieve better project prioritization (Cavallo, Powell, and

Serebrisky, 2020). With respect to the former, it is important that countries develop decarbonization strategies that set out the economic benefits of the transition to low-carbon activities clearly and transparently. As regards the latter, project selection criteria should favor sectors that contribute to decarbonization while generating jobs and improving equity.

1.2 Financing Sustainable, Equitable, and Resilient Economic Recovery

Financing strategies identify and foster access to resource flows that support a country's transition to the low-emission, climate-resilient economy (Chapter 5). This involves designing financing programs that are compatible with medium-term fiscal frameworks and include multiyear projections of resource demand and financing from public and private financial entities (both national and international). As explained in Chapter 6, a robust financial strategy for climate action is the result of a process by which a country determines what needs to be financed, how it will be financed, who will finance it, and how the attainment of climate targets will be measured. Countries that lack such a financial strategy still have time to use this approach when designing and implementing post-Covid economic recovery packages.

Additionally, financing mechanisms and instruments should be identified to mobilize resources in a sustainable and scalable way to meet international commitments and achieve the objectives of national climate change policy. To this end, governments should consider arranging and/or developing financial instruments, accessing funding sources, structuring attractive investment opportunities for the private sector in areas relating to sustainable recovery, and promoting risk transfer and insurance mechanisms.

The following are examples of financing instruments that could be used to finance activities relating to recovery and the transition to the zero-carbon economy:

A

Climate/green bonds: As noted in Chapter 5, the green bond market has grown steadily and within a relatively short space of time, demonstrating its importance to the wider capital market. In the region, Chile has demonstrated both its commitment to combating climate change and its leadership in green financing by becoming the first issuer of sovereign green bonds in the Americas and the first non-European issuer of a sovereign green bond in Europe. Chile achieved several milestones with this innovative transaction, including the lowest rate obtained in both currencies, low spreads, record demand, and an expansion of its investor base to include those with green mandates (Chapter 5, Section 3). Increased issuance of such bonds, especially

by developing countries, would help unlock cross-border financing for climate action. Catastrophic bonds represent another possible source of financing, the purpose of which is to secure budgetary resources for specific reconstruction projects. These have been used by the Mexican Fund for Natural Disasters.

B Debt-for-climate swaps: Debt-for-climate swaps consist of the sale of a foreign currency debt to an investor, or forgiveness of a debt by a creditor, in exchange for investment of the debt relief in climate change-related activities. Adjusting the approach could allow debt swaps to provide financing for climate action, including mitigation and adaptation measures. A debt-for-climate swap does not necessarily put more resources at the disposal of a government (especially in the case of highly indebted countries), yet a properly designed swap can create fiscal space to mobilize more domestic savings for climate change-related investments. In Latin America and the Caribbean, Costa Rica has carried out several debt-for-nature swaps, and in 2020, the 10th call for projects was launched under the U.S.-Costa Rica Debt-for-Nature Swap program (Forever Costa Rica Association, 2020). Several conservation projects are expected to be financed as a result of these swap operations, especially those that include direct actions to mitigate the impact of the COVID-19 pandemic on biodiversity and the livelihoods of communities.

C Insurance and guarantees: Insurance is a risk transfer mechanism that provides resources for climate-related disasters and transfers the responsibility for losses to capital market investors. Insurance products play a critical role in risk management, and their use can be promoted in green assets, reinsurance for high-risk assets, and sovereign catastrophic risk plans. Likewise, two forms of guarantees can be used: (i) commitments to pay a debt related to a climate change activity, or (ii) instruments to improve credit profiles when structuring sustainable infrastructure projects.

Another mechanism is risk-sharing funds, such as the Caribbean Catastrophe Risk Insurance Facility, which was established in 2007 as a risk pool for several countries. The Facility operates as an insurance company controlled by its member countries, and it offers insurance policies for hurricanes, earthquakes, excess rainfall, and the fishing sector. It allows countries to purchase coverage similar to business interruption insurance, providing them with immediate liquidity in the event of a natural disaster. The financial structure of the insurance instrument allows the Facility to provide countries with tailored coverage at a significantly lower cost than in the financial

markets. It limits the financial impact of natural disasters and provides fast-disbursing short-term liquidity to the 22 member countries.

Multilateral development banks can also play an especially important role by supporting the implementation of financial instruments and mechanisms and/or providing direct financing (contingent credit lines, loans, and guarantees for both the public and private sectors). The MDBs also occupy a privileged position in terms of their ability to channel resources and technical assistance to help countries develop financing strategies for recovery and the transition to the zero-carbon economy. Lastly, these institutions maintain links with all relevant stakeholders in the public and private sectors, civil society and social organizations, thus facilitating the consensus-building needed to develop climate change financing strategies.

Annex

Natural Disaster Risk Management and Climate Change

The Sendai Framework for Disaster Risk Reduction, approved by the United Nations General Assembly in 2015, is the global blueprint for disaster risk management (DRM) and it has been signed by every Latin American and Caribbean country. The second priority listed in the agreement is to strengthen disaster risk governance for better disaster risk management. Governance refers to the capacity to govern a public problem, as manifest in continuous and stable management not only by governments and public administrations as a whole, but also by sector and private stakeholders in a country. As the capacity to govern a public problem increases, there should be an observable increase in the effectiveness of the adopted decisions and implemented policies, thus helping to prevent a greater number of negative consequences that result in the event of a disaster.

The Index of Governance and Public Policy in Disaster Risk Management (iGOPP), developed by the IDB in 2012 (IDB, 2015), is made up of 245 indicators that reflect the regulatory, institutional, and budgetary conditions required for effective public DRM policy. Conceptually, the iGOPP is divided into two dimensions: (i) governance from a DRM perspective, and (ii) the phases of public policy (see Table 3).

The DRM dimension is broken down into six components:

- 1 General governance framework for DRM:** This refers to the regulatory foundation for organizing and coordinating DRM, including regulations, resource availability, and the creation of satisfactory arrangements for information and citizen participation, as well as mechanisms for monitoring, evaluating, and following up on these processes.
- 2 Risk identification and knowledge:** This process focuses on understanding the origins, causes, scope, frequency, and possible evolution of potentially dangerous phenomena, as well as the location, causes, evolution, and

resilience and recovery capacity of exposed socioeconomic groups. It includes preliminary analysis of the consequences of disasters.

- 3 Risk reduction:** This process focuses on minimizing vulnerabilities and risks in a society with a view to preventing or mitigating the adverse impact of hazards, all within the broader context of sustainable development. The iGOPP conceptual framework refers to the need for a regulatory, institutional, and budgetary framework that facilitates timely and adequate intervention to address the causes of vulnerability.
- 4 Disaster preparedness:** The objective of this process is to plan, organize, and test society's disaster response procedures and protocols, thus ensuring adequate and timely assistance for those affected. Preparedness involves monitoring events, determining risk scenarios, and planning, organizing, training, resourcing, and simulating the actions that must be carried out in the event of an emergency (alert, evacuation, search, rescue, relief, and humanitarian assistance).
- 5 Recovery planning:** This ex ante process focuses on preparing for the rapid restoration of acceptable, sustainable living conditions through the rehabilitation, repair, or reconstruction of infrastructure, goods, and services, as well as the reactivation or promotion of community economic and social development. Levels of risk must be reduced compared to those before the disaster. The iGOPP conceptual framework refers to the need for a governance framework that facilitates the planning of mechanisms to restore livelihoods, basic services, and infrastructure in a way that reduces improvisation, inefficiencies, and ineffectiveness in post-disaster recovery processes.
- 6 Financial protection:** This process seeks the optimal combination of financial mechanisms or instruments for risk retention and transfer, with a view to accessing economic resources in a timely manner after a disaster. This, in turn, improves disaster response capabilities for both minor, recurring events and large, infrequent disasters, and also protects the government's fiscal balance (Ghesquiere and Mahul, 2010). The iGOPP conceptual framework refers to the need for a regulatory, institutional, and budgetary framework that allows for the design and implementation of an adequate structure for disaster risk retention and transfer.

The “**phases of public policy**” dimension is divided into three main steps:

- 1 Inclusion in the government agenda and policy formulation:** The inclusion of DRM in the government’s agenda demonstrates recognition and acceptance of the public problem, a commitment to solving it, and the level of political and social pressure received by government institutions. The iGOPP analyzes this step by verifying the existence of appropriate legal frameworks for DRM or, alternatively, inclusion of the topic in sector and subnational regulations. It addresses this at three levels: (i) central policy coordination and articulation, (ii) definition of sector responsibilities, and (iii) definition of subnational responsibilities.
- 2 Policy implementation phase:** The iGOPP analyzes evidence of implementation by verifying the actions carried out or resources allocated to the parties responsible for implementing the various components of DRM policy across the different levels of government.
- 3 Policy evaluation phase:** The iGOPP analyzes the policy evaluation stage through verification of the existence of control and accountability mechanisms, as well as arrangements for information and citizen participation.

Table 3. Conceptual Matrix of the Index of Governance and Public Policy in Disaster Risk Management (iGOPP)

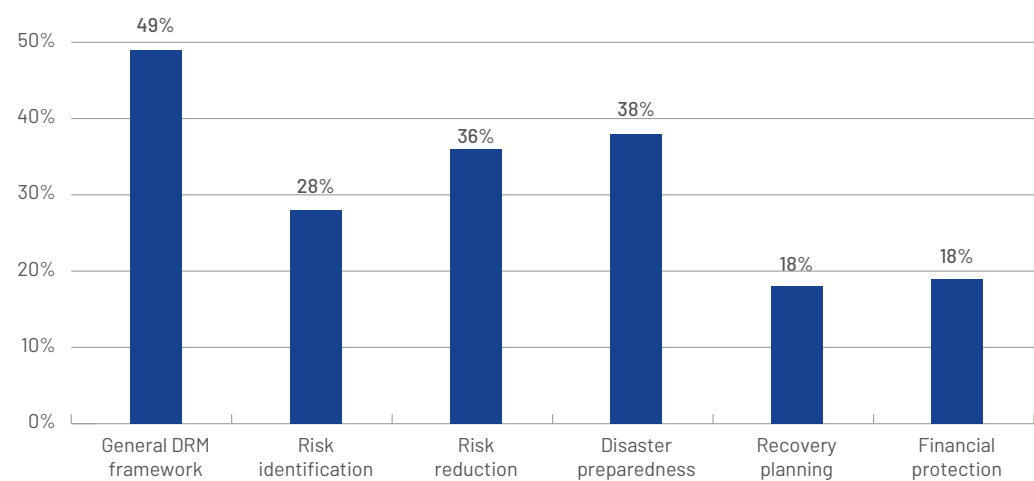
| Public Policy Phases Components of Public Policy Reform in DRM | 1. Inclusion in the Government Agenda and Policy Formulation | | | 2. Policy Implementation | 3. Policy Evaluation |
|-----------------------------------------------------------------------|--------------------------------------------------------------|---------------------------------------|--------------------------------------------|----------------------------------------|--------------------------------------------|
| | Central policy coordination and articulation | Definition of sector responsibilities | Definition of subnational responsibilities | Evidence of progress in implementation | Control, accountability, and participation |
| General governance framework for DRM (GF) | GF-1A | GF -1B | GF -1C | GF -2 | GF -3 |
| Risk identification (RI) | RI-1A | RI-1B | RI -1C | RI-2 | RI-3 |
| Risk reduction (RR) | RR-1A | RR-1B | RR -1C | RR-2 | RR-3 |
| Disaster preparedness (DP) | DP-1A | DP-1B | DP-1C | DP-2 | DP-3 |
| Recovery planning (RP) | RP -1A | RP -1B | RP -1C | RP-2 | RP-3 |
| Financial protection (FP) | FP -1A | FP -1B | FP -1C | FP-2 | FP-3 |

Source: Authors' elaboration.
 DRM: Disaster Risk Management

Each of the cells in the iGOPP conceptual matrix (Table 3) contains a variable number of indicators that measure the verifiable existence of governance conditions for each DRM component and policy phase.

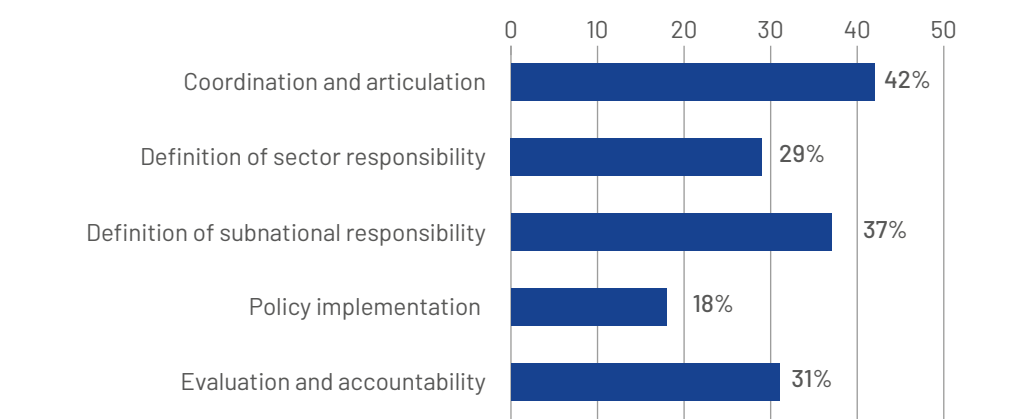
With respect to the components of DRM, Figure 14 shows that the Latin American and Caribbean countries perform best in the categories of general governance frameworks and disaster preparedness, scoring 49 percent and 38 percent, respectively. The lowest scores are for financial protection and recovery planning, at 19 percent and 18 percent, respectively.

Figure 14. iGOPP Scores in Latin America and the Caribbean, by Disaster Risk Management Component



With respect to public policy phases, Figure 15 shows that progress in the Latin American and Caribbean countries has been most significant with respect to central policy coordination and articulation (42 percent) and the definition of subnational responsibilities (37 percent). This reflects the fact that countries generally have national DRM regulations with a series of recommended features, such as a comprehensive approach to disaster risk (including both response and prevention) and coordination across different levels of government. Meanwhile, decentralization regulations usually subnational governments’ responsibilities in the area of DRM. In contrast, the iGOPP results point to substantial gaps in the areas of policy implementation (18 percent), the definition of sector responsibilities (29 percent), and policy evaluation and accountability (31 percent).

Figure 15. iGOPP Scores in Latin America and the Caribbean, by Public Policy Phase



BIBLIOGRAPHY

- Alcaldía Mayor de Bogotá. 2014. Decreto 566 de 2014. Available at <https://www.habitatbogota.gov.co/decreto-566-2014>.
- Alejos, L. A. 2018. Three Essays in Public Finance in Developing Countries. Doctoral thesis, University of Michigan. Available at https://deepblue.lib.umich.edu/bitstream/handle/2027.42/147524/lalejos_1.pdf?sequence=1.
- Andean Development Corporation. 2013. La infraestructura en el desarrollo integral de América Latina. La productividad en la inversión y la logística para la competitividad. Caracas: CAF. Available at <http://scioteca.caf.com/handle/123456789/324>.
- Armendáriz, E. and E. Contreras. 2016. El gasto de inversión pública en América Latina: cuánto and cuán eficiente. Presentation to the VI Seminar of the Latin American and Caribbean National Public Investment Systems Network, Costa Rica, 19 April. Available at https://www.cepal.org/ilpes/noticias/paginas/1/55281/IDB_Edna_Armendariz.pdf.
- Armendáriz, E., J. L. Gómez Reino, and G. Reyes-Tagle. 2020. Hacer más con menos: Recomendaciones para mejorar la inversión pública en la post-pandemia. Washington, D.C.: IDB. Available at <https://blogs.iadb.org/gestion-fiscal/es/hacer-mas-con-menos-recomendaciones-inversion-publica/>.
- Asamblea Nacional de la República de Nicaragua. 2014. Ley de Reforma a la Ley No. 337 "Ley Creadora del Sistema Nacional para la Prevención, Mitigación and Atención de Desastres." *La Gaceta, Diario Oficial No. 90* (14 May). Available at [http://legislacion.asamblea.gob.ni/Nor-maweb.nsf/\(\\$All\)/6D8DCFF6602D728306257CE-C00717C55?OpenDocument](http://legislacion.asamblea.gob.ni/Nor-maweb.nsf/($All)/6D8DCFF6602D728306257CE-C00717C55?OpenDocument).
- Audoly, R., A. Vogt-Schilb, C. Guivarch, et al. 2018. Pathways toward Zero-Carbon Electricity Required for Climate Stabilization. *Applied Energy*, 225: 884-01. Available at <https://doi.org/10.1016/j.apenergy.2018.05.026>.
- Banco de México. 2020. *Climate and environmental risks and opportunities in Mexico's financial system. From diagnosis to action*. Available at <https://www.banxico.org.mx/sistema-financiero/d/%7B3A8C7F15-9FE1-9A2A-DCF7-6C6D11A0E1DB%7D.pdf>
- Bank of England. 2019. Insurance Stress Test 2019. Available at <https://www.bankofengland.co.uk/prudential-regulation/letter/2019/insurance-stress-test-2019>.
- Barandiarán, M., Esquivel, M., Lacambra Ayuso, S., Suarez, G., et al. 2018. *Executive Summary of the Disaster and Climate Risk Assessment Methodology for IDB Projects: A Technical Reference for IDB Project Teams*. Washington D.C.: IDB. Available at <http://dx.doi.org/10.18235/0001445>.
- Bastagli, F., Hagen-Zanker, J., Harman, L., et al. 2016. *Cash transfers: what does the evidence say? A rigorous review of programme impact and of the role of design and implementation features*. London: Overseas Development Institute.

- Benson, C. and Clay, E. J. 2004. Understanding the Economic and Financial Impacts of Natural Disasters. Disaster Risk Management Series. World Bank.
- Bento, A. M., Jacobsen, M. R. and Liu, A. A. Julio de 2018. Environmental policy in the presence of an informal sector. *Journal of Environmental Economics and Management*, 90: 61-77. Available at <https://doi.org/10.1016/j.jeem.2018.03.011>.
- Bhattacharya, A., Contreras-Casado, A., Jeong, M., et al. 2019a. *Attributes and Framework for Sustainable Infrastructure*. IDB Technical Note. No. IDB-TN-01653. Washington, D.C.: IDB. Available at https://publications.iadb.org/publications/english/document/Attributes_and_Framework_for_Sustainable_Infrastructure_en_en.pdf.
- Binsted, M., J. Edmonds, A. Vogt-Schilb, et al. 2020. Stranded Asset Implications of the Paris Agreement in Latin America and the Caribbean. *Environ. Res. Lett.* 15 044026.
- Bloomberg NEF. 2020. *Electric Vehicle Outlook*. Available at <https://bnef.turtl.co/story/evo2020/>.
- BP. 2017. *BP Statistical Review of World Energy June 2017* (66a. edition). London: BP p.l.c. Available at <http://large.stanford.edu/courses/2018/ph241/kuet2/docs/bp-2017.pdf>.
- Caldecott, B., E. Harnett, T. Cojoian, et al. 2016. Stranded Assets: A Climate Risk Challenge (Summary). Washington, D.C.: IDB.
- Carbon Tracker Initiative. 2011. Unburnable Carbon: Are the world's financial markets carrying a carbon bubble? Available at <https://carbontracker.org/reports/carbon-bubble/>.
- . 2018. Mind the Gap: The \$1.6 Trillion Energy Transition Risk. Available at <https://www.carbontracker.org/Reports/Mind-the-Gap>.
- Carney, M. 2015. Breaking the tragedy of the horizon –climate change and financial stability– speech by Mark Carney. London: Bank of England. Available at <https://www.bankofengland.co.uk/speech/2015/breaking-the-tragedy-of-the-horizon-climate-change-and-financial-stability>.
- Cavallo, E., A. Powell, and T. Serebrisky. 2020. From Structures to Services: The Path to Better Infrastructure in Latin America and the Caribbean. Washington, D.C.: IDB.
- Cecchini, S., F. Filgueira, R. Martínez, et al. 2015. Towards universal social protection: Latin American pathways and policy tools. Libros de la CEPAL, No. 136 (LC/G.2644-P). Santiago de Chile: Economic Commission for Latin America and the Caribbean.
- Center for International Climate and Environmental Research and Climate Policy Initiative. 2015. *Background Report on Long-Term Climate Finance*. Oslo: CICERO and CPI. Available at <https://www.climatepolicyinitiative.org/wp-content/uploads/2015/06/2015-Background-report-on-long-term-climate-finance.pdf>.
- Centre for Research on the Epidemiology of Disasters. 2009. The International Disaster Database. EM-DAT. Brussels: CRED. Available at <https://www.emdat.be>.
- Centro de Estudios de las Finanzas Públicas. 2018. Paquete Económico 2019. Criterios Generales de Política Económica. Ciudad de México: CEFP. Available at <https://www.cefp.gob.mx/indicadores/gaceta/2018/iescefp0502018.pdf>.
- Centro Nacional de Prevención de Desastres. 2017. Índice de Gobernabilidad y Políticas Públicas (IGOPP) en la Gestión Integral del Riesgo (GIR) en México. Ciudad de México: CENAPRED. Available at <http://www.atlasnacionalderiesgos.gob.mx/IGOPP/>.
- Climate Bonds Initiative. 2020. Labelled Green Bonds Data. Climate Bonds Initiative. Available at <https://www.climatebonds.net/cbi/pub/data/bonds>.
- Coady, D. and I. W. Parry. 2018. Energy Price Reform: Lessons for Policymakers. *Review of Environmental Economics and Policy*, Vol. 12(2): 197-19. Available at <https://doi.org/10.1093/reep/rey004>.
- Coady, D., I. W. Parry, N.-P. Le, et al. 2019. Global Fossil Fuel Subsidies Remain Large: An Update Based on Country-Level Estimates. IMF Working Paper 18/89. Washington, D.C.: International

- Monetary Fund. Available at <https://www.imf.org/en/Publications/WP/Issues/2019/05/02/Global-Fossil-Fuel-Subsidies-Remain-Large-An-Update-Based-on-Country-Level-Estimates-46509>.
- Davis, S. J., N. S. Lewis, M. Shaner, et al. 2018. Net-zero emissions energy systems. *Science*. Available at <https://doi.org/10.1126/science.aas9793>.
- Davis, S. J. and R. H. Socolow. 2014. Commitment accounting of CO₂ emissions. *Environmental Research Letters*, Vol. 8, pág. 9 084018.
- Departamento Nacional de Planeación. 2016. *Guía metodológica para clasificar y medir el financiamiento asociado con acciones de mitigación y adaptación al cambio climático en Colombia*. Bogota: DNP, Comité de Gestión Financiera. Available at <https://mrv.dnp.gov.co/Publicaciones/Documents/GUÍA%20METODOLÓGICA%20PARA%20CLASIFICAR%20Y%20MEDIR%20EL%20FINANCIAMIENTO%20ASOCIADO%20CON%20ACCIONES%20DE%20MITIGACIÓN%20Y%20ADAPTACIÓN.pdf>.
- Eguino, H. 2020. How Efficient Is the Management of Subnational Public Investment? The Situation in the Federal Countries of Latin America. Washington D.C.: IDB. Available at <https://publications.iadb.org/en/how-efficient-management-subnational-public-investment-situation-federal-countries-latin-america>.
- Elliott, C., J. Worker, K. Levin, et al. 2019. Good Governance for Long-Term Low-Emissions Development Strategies. Washington, D.C.: World Resources Institute. Available at <https://files.wri.org/s3fs-public/good-governance-long-term-low-emissions-development-strategies.pdf>.
- European Academies Science Advisory Council. 2018. *Extreme weather events in Europe—Preparing for climate change adaptation: an update on EASAC's 2013 study*. Halle: EASAC. Available at <https://www.preventionweb.net/publications/view/57583>.
- European Commission. 2016. Benefits of GPP. Brussels: European Commission. Available at https://ec.europa.eu/environment/gpp/benefits_en.htm.
- Faust, E. 2018. Climate facts 2017: The warmest non-El Niño year ever. *Topics Geo. Natural catastrophes 2016: Analyses, assessments, positions*. 2017 issue, pp. 67-69. Available at <https://www.munichre.com/topics-online/en/climate-change-and-natural-disasters/climate-change/climate-facts-2017.html#>.
- Fay, M., S. Hallegatte, A. Vogt-Schilb, et al. 2015. *Decarbonizing Development: Three Steps to a Zero-Carbon Future*. Washington, D.C.: World Bank. Available at <https://www.worldbank.org/content/dam/Worldbank/document/Climate/dd/decarbonizing-development-report.pdf>.
- Feng, K., K. Hubacek, Y. Liu, et al. 2018. Managing the distributional effects of energy taxes and subsidy removal in Latin America and the Caribbean. *Applied Energy*, Vol. 225: 424-36. Available at <https://doi.org/10.1016/j.apenergy.2018.04.116>.
- Ferro, P., M. Jaramillo, R. Delgado, et al. 2020. Contribuciones Nacionalmente Determinadas (NDCs) y Presupuestos Nacionales en América Latina y el Caribe: Estudios de Casos Argentina, Colombia, Jamaica, México y Perú. (Pending publication.) Washington D.C.: IDB.
- Forever Costa Rica Association. 2020. Disponibles \$600.000 para financiar proyectos de conservación de la biodiversidad que mitiguen impactos del COVID-19. Available at <https://primercanjedeuda.org/decima-convocatoria-para-mitigar-impactos-covid19/>.
- Frisari, G., M. Gallardo, C. Nakano, et al. 2019. *Climate Risk and Financial Systems of Latin America: Regulatory, Supervisory and Industry Practices in the Region and Beyond*. Washington, D.C.: IDB. Available at <https://doi.org/10.18235/0002046>.
- Funke, F. and L. Merril. 2019. *How Reforming Fossil Fuel Subsidies Can Go Wrong: A lesson from Ecuador*. Winnipeg: International Institute for Sustainable Development. Available at <https://www.iisd.org/articles/lesson-ecuador-fossil-fuel-subsidies>.
- Ghesquiere, F. and O. Mahul. 2010. Financial Protection of the State against Natural Disasters: A Primer. Policy Research working

- paper; WPS 5429. Washington, D.C.: World Bank. Available at <http://hdl.handle.net/10986/3912>.
- Global Commission on Adaptation. 2019. Adapt now: A global call for leadership on climate resilience. Global Commission on Adaptation. New York: United Nations. Available at https://cdn.gca.org/assets/2019-09/GlobalCommission_Report_FINAL.pdf.
- Global Commission on the Economy and Climate. 2014. Better Growth, Better Climate: The New Climate Economy Report. Washington, D.C.: New Climate Economy c/o World Resources Institute.
- Global Sustainable Investment Alliance. 2019. Sustainable Investor Poll on TCFD Implementation. GSIA.
- Gobierno de Costa Rica. 2019. Plan Nacional de Descarbonización 2018-2050. San José: Gobierno de Costa Rica. Available at https://www4.unfccc.int/sites/SubmissionsStaging/NationalReports/Documents/7160385_Costa%20Rica-BUR2-1-IBA-2019.pdf AUTORES: Parece que el enlace actual no corresponde al título. Por favor, vean si es el siguiente enlace: <https://minae.go.cr/images/pdf/Plan-de-Descarbonizacion-1.pdf>.
- Gobierno de la República de Panamá. 2015. Resolución No. 123. *Gaceta Oficial Digital*, 13 July 2015. Panama City: Gobierno de la República de Panamá.
- González-Mahecha, R. E., A. F. Lucena, R. Garaffa, et al. 2019. Greenhouse gas mitigation potential and abatement costs in the Brazilian residential sector. *Energy and Buildings*, Vol. 184: 19-33. Available at <https://www.sciencedirect.com/science/article/abs/pii/S0378778818320310>.
- Governo Federal do Brasil. 2014. Portal de Compras. Brasília: Governo Federal do Brasil. Available at <https://www.comprasgovernamentais.gov.br/index.php/legislacao/instrucoes-normativas/304-instrucao-normativa-n-2de-04-de-junho-de-2014>.
- Green Growth Best Practices. 2014. Green Growth in Practice: Lessons from Country Experiences. GGBP. Available at https://www.greengrowthknowledge.org/sites/default/files/downloads/resource/Green-Growth-inPractice-GGBP_0.pdf.
- Groves, D. G., J. Syme, E. Molina Pérez, et al. 2020. Costos y beneficios de la descarbonización de la economía de Costa Rica: evaluación del Plan Nacional de Descarbonización bajo incertidumbre. San José: Laboratorio de Investigación de Potencia y Energía Eléctrica de la Universidad de Costa Rica, RAND Corporation, Dirección de Cambio Climático, Ministerio de Ambiente y Energía de Costa Rica and IDB.
- Guerrero Compeán, R., L. Salazar, and S. Lacambra Ayuso. 2017. *Gestionando el riesgo: Efectos de la gobernabilidad en las pérdidas humanas por desastres en América Latina y el Caribe*. Washington, D.C.: IDB. Available at <http://dx.doi.org/10.18235/0000802>.
- High-Level Commission on Carbon Prices. 2017. *Report of the High-Level Commission on Carbon Prices*. Washington, D.C.: World Bank.
- Huxham, M., M. Anwar, and D. Nelson. 2019. Understanding the impact of a low carbon transition on South Africa. Oslo: Climate Policy Initiative.
- Ibarrán, P., N. Medellín, F. Regalia, et al. 2017. *How Conditional Cash Transfers Work: Good Practices after 20 Years of Implementation*. Washington, D.C.: IDB. Available at <http://dx.doi.org/10.18235/0000746>.
- Instituto Nacional de Estadísticas. 2018. *Empleo Trimestral*. Edition 240. Santiago: INE.
- Inter-American Development Bank. 2015. iGOPP: Index of Governance and Public Policy in Disaster Risk Management. Washington, D.C.: IDB. Available at <https://publications.iadb.org/handle/11319/6717>.
- . 2019b. RG-T3368 : Regional Green Bonds Program for Latin America and the Caribbean. Washington, D.C.: IDB. Available at <https://www.iadb.org/en/project/RG-T3368>.
- . 2020a. Towards a Green Economy - Support for Costa Rica's Decarbonization Plan. Washington, D.C.: IDB.

- , 2020b. Policies to Fight the Pandemic: 2020 Latin American and Caribbean Macroeconomic Report. Washington, D.C.: IDB.
- Inter-American Development Bank and Deep Decarbonization Pathways in Latin America. 2019. Getting to Net-Zero Emissions: Lessons from Latin America and the Caribbean. Washington, D.C.: IDB and DDPLAC. Available at <https://publications.iadb.org/en/getting-net-zero-emissions-lessons-latin-america-and-caribbean>.
- International Energy Agency. 2017. *Oil 2017: Analysis and forecasts to 2022*. Paris: IEA. Available at <https://www.iea.org/reports/oil-2017>.
- , 2018. *Global EV Outlook 2018*. Paris: IEA. Available at <https://www.iea.org/reports/global-ev-outlook-2018>.
- , 2019a. *World Energy Outlook 2019*. Paris: IEA. Available at <https://www.iea.org/reports/world-energy-outlook-2019>.
- , 2019b. Multiple Benefits of Energy Efficiency. Paris: IEA. Available at <https://www.iea.org/reports/multiple-benefits-of-energy-efficiency/public-budgets>.
- International Institute for Sustainable Development. 2010. *Lessons Learned from Brazil's Experience with Fossil-Fuel Subsidies and their Reform*. Geneva: IISD.
- , 2015. *Implementing Sustainable Public Procurement in Latin America and the Caribbean*. Manitoba and Geneva: IISD.
- International Labour Organization. 2012. *Promoting safety and health in a green economy*. Geneva: ILO.
- , 2015. *Guidelines for a just transition towards environmentally sustainable economies and societies for all*. Geneva: ILO. Available at https://www.ilo.org/wcmsp5/groups/public/-ed_emp/-emp_ent/documents/publication/wcms_432865.pdf.
- , 2017. *World Social Protection Report 2017-19 Universal social protection to achieve the Sustainable Development Goals*. Geneva: ILO.
- International Monetary Fund. 2013. *Energy Subsidy Reform: Lessons and Implications*. Washington, D.C.: IMF.
- , 2019a. *World Economic Outlook*. Washington, D.C.: IMF.
- , 2019b. *Fiscal Policies for Paris Climate Strategies—from Principle to Practice*. IMF. Available at <https://www.imf.org/en/Publications/Policy-Papers/Issues/2019/05/01/Fiscal-Policies-for-Paris-Climate-Strategies-from-Principle-to-Practice-46826>.
- , 2020. *World Economic Outlook*. Washington, D.C.: IMF. Available at <https://www.imf.org/es/Publications/WEO>.
- International Renewable Energy Agency. 2020. *Renewable Power Generation Costs in 2019*. Abu Dhabi: IRENA.
- Izquierdo, A., C. Pessino, and G. Vuletin. 2018. *Better Spending for Better Lives: How Latin America and the Caribbean Can Do More with Less*. Development in the Americas series. Washington, D.C.: IDB.
- Kull, D., R. Mechler, and S. Hochrainer-Stigler. 2013. Probabilistic cost-benefit analysis of disaster risk management in a development context. *Disasters* 2013, 37(3): 374-400. Available at <https://doi.org/10.1111/disa.12002>.
- Kumar Shakya, R. 2019. *Green Public Procurement Strategies for Environmental Sustainability*. IGI Global. Available at <http://doi:10.4018/9781-5225-7083-7>.
- Lasse Toft, C. B. 2016. LPG Subsidy Reform –Options for Indonesia. International Experiences with LPG Subsidy Reform. Available at <http://www.jstor.com/stable/resrep14790.6>.
- Latin American and Caribbean Economic System. 2014. *Las compras públicas como herramienta de desarrollo en América Latina y el Caribe*. Caracas: SELA.
- Latin American Energy Organization. 2020. *Energy Information System of Latin America and the Caribbean (sieLAC)*. Quito: OLADE. Available at <http://sielac.olade.org>.

- Leaton, J. 2015. The \$2 trillion stranded assets danger zone: How fossil fuel firms risk destroying investor returns. Carbon Tracker Initiative. Carbon Tracker Initiative. Available at https://yoursri.be/Plone/media-new/download/car3817_synthesis_report_24-11-15_web.pdf.
- León, J. 2017. Efectos Macroeconómicos de El Niño en Costa Rica. San José: Banco Central de Costa Rica.
- Liu, A. A. 2013. Tax evasion and optimal environmental taxes. *Journal of Environmental Economics and Management*, Vol. 66(3): 656–70. Available at <https://doi.org/10.1016/j.jeem.2013.06.004>.
- Mann, M. E., S. Rahmstorf, K. Kornhuber, et al. 2017. Influence of Anthropogenic Climate Change on Planetary Wave Resonance and Extreme Weather Events. *Scientific Reports* 7:45242. Available at <https://doi.org/10.1038/srep45242>. (Correction published in Scientific Reports. 2017 May 26;7:46822)
- Masson-Delmotte, V., P. Zhai, H.-O. Pörtner, et al. (eds.). 2018. Global Warming of 1.5°C. An IPCC Special Report on the impacts of global warming of 1.5°C above pre-industrial levels and related global greenhouse gas emission pathways, in the context of strengthening the global response to the threat of climate change, sustainable development, and efforts to eradicate poverty. Geneva: Intergovernmental Panel on Climate Change.
- McGlade, C. and Ekins, P. 2015. The geographical distribution of fossil fuels unused when limiting global warming to 2°C. *Nature* 517: 18–90. Available at <https://doi.org/10.1038/nature14016>.
- McKinsey & Company. 2020. How a post-pandemic stimulus can both create jobs and help the climate (27 May). Available at <https://www.mckinsey.com/business-functions/sustainability/our-insights/how-a-post-pandemic-stimulus-can-both-create-jobs-and-help-theclimate>.
- Mechler, R. 2016. Reviewing estimates of the economic efficiency of disaster risk management: opportunities and limitations of using risk-based cost-benefit analysis. *Natural Hazards* 81: 212147. Available at <https://doi.org/10.1007/s11069016-2170-y>.
- Méndez, J. 2019. La industria de la construcción contribuye con el 6.5% del PIB en la economía nacional. Puebla: UPPRESS. Available at <https://upress.mx/index.php/noticias/notadel-dia/6077-la-industria-de-la-construccioncontribuye-con-el-6-5-del-pib-en-la-economia-nacional>.
- Ministerio de Energía y Minería. n.d. Programa de Eficiencia Energética en Edificios Públicos. Buenos Aires: MINEM. Available at <http://edificioeficientes.minem.gob.ar>.
- Ministerio de Hacienda de Chile. 2019a. Mesa Público-Privada de Finanzas Verdes. Santiago: Ministerio de Hacienda de Chile. Available at <https://mfv.hacienda.cl/publicaciones>.
- . 2019b. Marco para los Bonos Verdes de Chile. Santiago: Ministerio de Hacienda de Chile. Available at <https://www.paiscircular.cl/wp-content/uploads/2019/07/Chile-GB-Framework-Final-Español.pdf>.
- Ministerio de Hacienda de la República del Paraguay. 2020. Ley No. 6.469. Annex Clasificador Presupuesto de Ingresos, Gastos y Financiamiento. Asunción: Gobierno de Paraguay. Available at <https://www.hacienda.gov.py/web-hacienda/archivo.php?a=9595989ea9a2a8a3a763a4a69993666466646397a095a79d9a9d979598a-3a6546664666462a4989a95034&x=-9797036&y=k5k50a3>.
- Ministerio de Medio Ambiente de Perú. 2015. Caracterización y Cuantificación del Gasto Público Ambiental Peruano. Lima: MINAM. Available at https://cdn.www.gob.pe/uploads/document/file/155201/08_informe-gpa.pdf.
- Moench, M., R. Mechler, and S. Stapleton. 2007. High Level Dialogue. Information Note No. 3 Costs and Benefits of Disaster Risk Reduction. Geneva: United Nations Office for Disaster Risk Reduction. Available at https://www.unisdr.org/files/1084_InfNote3HLDIALOGUECostsandBenefits.pdf.
- Munich RE. 2018. TOPICS Geo. *Natural catastrophes 2017. Analyses, assessments, positions. A stormy*

- year. Munich: Munich RE. Available at https://www.munichre.com/content/dam/munichre/global/content-pieces/documents/TOPICS_GEO_2017-en.pdf/_jcr_content/renditions/original./TOPICS_GEO_2017-en.pdf.
- Murray, V. and K. L. Ebi. 2012. IPCC Special Report on Managing the Risks of Extreme Events and Disasters to Advance Climate Change Adaptation (SREX). *J Epidemiol Community Health*, Vol. 66(9): 759-60.
- Naidoo, C., A.-L. Amin, T. Dimsdale, et al. 2014. *Strategic national approaches to climate finance. Report on scoping work in Peru, Chile and Colombia on national climate finance pathways and strategies*. London: E3G.
- Network of Central Banks and Supervisors for Greening the Financial System. n.d. Membership [Internet]. Paris: NGFS. Available at <https://www.ngfs.net/en/about-us/membership>.
- National Institute of Building Sciences. 2015. *Natural Hazard Mitigation Saves: An Independent Study to Assess the Future Saving from Mitigation Activities*. NIBS. Available at https://www.nibs.org/?page=mmc_projects.
- Organization for Economic Cooperation and Development. 2010. *Cities and Climate Change*. Paris: OECD.
- , 2015. *Going Green: Best Practices for Sustainable Procurement*. Paris: OECD. Available at https://www.oecd.org/gov/ethics/Going_Green_Best_Practices_for_Sustainable_Procurement.pdf.
- , 2017. *Investing in Climate, Investing in Growth*. Paris: OECD. Available at https://www.oecd-ilibrary.org/economics/investing-in-climate-investing-in-growth_9789264273528-en.
- Organization for Economic Cooperation and Development, et al. 2020. *Revenue Statistics in Latin America and the Caribbean 2020*. Paris: OECD. Available at <https://doi.org/10.1787/68739b9b-en-es>.
- Organization of American States, Inter-American Development Bank, and Inter-American Network on Government Procurement. 2020. *Sustainable Public Procurement in Latin America and the Caribbean. Actions Towards Implementation*. Washington, D.C.: OEA, IDB, and INGP. Available at <https://secureservercdn.net/198.71.233.44/u1y.854.myftpupload.com/wp-content/uploads/2020/05/Compras-Públicas-Sostenibles-en-América-Latina-y-El-Caribe-2020.pdf>.
- Organization of the Petroleum Exporting Countries. 2017. *Annual Statistical Bulletin*. Vienna: OPEC. Available at https://www.opec.org/opec_web/static_files_project/media/downloads/publications/ASB2017_13062017.pdf.
- Quattara, B. and E. Strobl. 2013. The fiscal implications of hurricane strikes in the Caribbean. *Ecological Economics*, Vol. 85(C): 105-15. Available at <https://EconPapers.repec.org/RePEc:eee:ecolec:v:85:y:2013:i:c:p:105-115>.
- Perera, O. 2009. *Life Cycle Costing in Sustainable Public Procurement: A Question of Value*. Geneva: International Institute for Sustainable Development. Available at https://www.iisd.org/sites/default/files/publications/life_cycle_costing.pdf.
- Pérez Trejo, C. A. 2015. *Riesgos fiscales en El Salvador: medición y capacidad de gestión*. San Salvador: Fundación Nacional para el Desarrollo. Available at <http://www.repo.funde.org/1061/1/Riesgos%20fiscales.pdf>.
- Perrotti, D. E. and R. Sánchez. 2011. *La brecha de infraestructura en América Latina y el Caribe*. Santiago: Economic Commission for Latin America and the Caribbean
- Pigato, M. A. (ed.). 2018. *Fiscal Policies for Development and Climate Action*. Washington, D.C.: World Bank Group. Available at <https://openknowledge.worldbank.org/bitstream/handle/10986/31051/9781464813580.pdf?sequence=4&isAllowed=y>.
- Pineda, E., O. Valencia, and L. Andrian, L. 2020. Posibles consecuencias macro-fiscales del COVID-19 en América Latina. Washington, D.C.: IDB. Available at <https://blogs.iadb.org/gestion-fiscal/es/posibles-consecuencias-macro-fiscales-covid-19-america-latina/>.

- Pizarro, R., R. Delgado, A. Lopes, et al. 2020. *Climate Change Public Budget Tagging: Connections across Financial and Environmental Classifications Systems*. (En proceso de publicación.) Washington, D.C.: IDB.
- Presidencia de Chile. 2019. Presidente Piñera presenta plan para cerrar todas las centrales energéticas a carbón y que Chile sea carbono neutral. Press release, 4 June 2019. Santiago: Gobierno de Chile. Available at <https://prensa.presidencia.cl/comunicado.aspx?id=96653>.
- Regelink, M., H. J. Reinders, M. Vleeschouwer, et al. 2017. Waterproof? An exploration of climate-related risks for the Dutch financial sector. Amsterdam: DeNederlandscheBank. Available at https://archieff20.archiefweb.eu/archives/archiefweb/20171005061409/https://www.dnb.nl/en/binaries/Waterproof_tcm47-363851.pdf?2020102815.
- Regional Observatory on Planning for Development. 2019. *Plan Nacional de Desarrollo de México 2019–2024*. Santiago: ORPD. Available at <https://observatorioplanificacion.cepal.org/es/planes/plan-nacional-de-desarrollo-de-mexico-2019-2024>.
- Rentschler, J. and M. Bazilian. 2017. Reforming fossil fuel subsidies: drivers, barriers and the state of progress. *Climate Policy*, Vol. 17: 891–914. Available at <https://doi.org/10.1080/14693062.2016.1169393>.
- Robles, M., M. G. Rubio, and M. Stampini. 2019. Have cash transfers succeeded in reaching the poor in Latin America and the Caribbean? *Development Policy Review*, Vol. 7(S2): 085–0139. Available at <https://doi.org/10.1111/dpr.12365>.
- Rodríguez Zúñiga, M., L. Gallardo, J. Quirós-Tortós, E. Molina, S. Charpentier, M. Jaramillo and A. Vogt-Schilb. 2020. *Evaluación del impacto fiscal de descarbonizar el sector transporte en Costa Rica y opciones de política para manejarlo*. Washington, D.C.: IDB.
- Rogelj, J., A. Popp, K. V. Calvin, et al. 2018. Scenarios toward limiting global mean temperature increase below 1.5 °C. *Nature Climate Change*, 325–332. Available at <https://doi.org/10.1038/s41558-018-0091-3>
- Roseth, B., A. Reyes, and C. Santiso. 2018. *Wait No More: Citizens, Red Tape, and Digital Government*. Washington, D.C.: IDB.
- Rozenberg, J., A. Vogt-Schilb, and S. Hallegattea. 2020. Instrument choice and stranded assets in the transition to clean capital. *Journal of Environmental Economics and Management*, Vol. 100, March 2020. Available at <https://doi.org/10.1016/j.jeem.2018.10.005>.
- Saget, C., A. Vogt-Schilb, and T. Luu. 2020. *Jobs in a Net-Zero Emissions Future in Latin America and the Caribbean*. Washington, D.C. and Geneva: IDB and ILO.
- Salazar Cota, A., L. Fernández, and W. Dalaison. 2018. *Green Procurement: How to Encourage Green Procurement Practices in IDB Funded Projects?* Washington, D.C.: IDB.
- Schaffitzel, F., M. Jakob, R. Soria, et al. 2020. Can Government Transfers Make Energy Subsidy Reform Socially Acceptable? A Case Study on Ecuador. *Energy Policy*, Vol. 137, February 2020, 111120. Available at <https://doi.org/10.1016/j.enpol.2019.111120>.
- Serebrisky, T. 2014. *Sustainable infrastructure for competitiveness and inclusive growth*. Washington, D.C.: IDB. Available at <https://publications.iadb.org/en/sustainable-infrastructure-competitiveness-and-inclusive-growth>.
- Serebrisky, T., A. Suárez-Alemán, C. Pastor, et al. 2017. *Increasing the Efficiency of Public Infrastructure Delivery: Evidence-based Potential Efficiency Gains in Public Infrastructure Spending in Latin America and the Caribbean*. Washington, D.C.: IDB.
- Sieb, A. 2011. Five benefits of green procurement. eSourcing Forum. *Sourcing Views & Industry News*, 29 November 2011. Available at <http://www.esourcingforum.com/archives/2011/11/29/five-benefits-of-green-procurement/>.
- Solano-Rodríguez, B., S. Pye, L. Pei-Hao, et al. 2019. *Implications of climate targets on oil production and fiscal revenues in Latin America and the Caribbean*. Washington, D.C.: IDB. Available at <http://dx.doi.org/10.18235/0001802>.

- Stockholm Environment Institute, International Institute for Sustainable Development, Overseas Development Institute, et al. 2019. *The Production Gap: The discrepancy between countries' planned fossil fuel production and global production levels consistent with limiting warming to 1.5°C or 2°C*. SEI, IISD, ODI, CICERO and UNEP. Available at <https://productiongap.org/wp-content/uploads/2019/11/Production-Gap-Report-2019.pdf>.
- Sullivan, R. 2011. *Investment-grade climate change policy financing the transition to the low-carbon economy*. IIGCC, INCR, IGCC and UNEP FI.
- Superintendencia Financiera de Colombia. 2019. Superfinanciera entrega los resultados de la primera encuesta sobre los riesgos derivados del Cambio Climático y las Finanzas Verdes por parte de las entidades vigiladas. Bogotá: Superintendencia Financiera de Colombia. Available at <https://www.superfinanciera.gov.co/jsp/10099920>.
- Task Force on Climate-Related Financial Disclosures. 2017. *Recommendations of the Task Force on Climate-related Financial Disclosures*. Basel: TCFD.
- Tax Policy Center, Urban Institute, and Brookings Institution. 2020. *Briefing Book*. Available at <https://www.taxpolicycenter.org/briefing-book/what-carbon-tax>.
- Thwaites, J., S. Whitley, H. Wright, and C. Ott. 2018. Aligning Finance Is the Forgotten Goal of the Paris Agreement, But It Is Vital to Successful Climate Action. Washington, D.C.: World Resources Institute. Available at <https://www.wri.org/blog/2018/12/aligning-finance-forgotten-goal-paris-agreement-it-vital-successful-climate-action>.
- Tong, D., Q. Zhang, Y. Zheng, et al. 2019. Committed emissions from existing energy infrastructure jeopardize 1.5 °C climate target. *Nature*, 572: 373-377. Available at <https://doi.org/10.1038/s41586-019-1364-3>.
- United Nations Development Programme. 2015. *A Methodological Guidebook: Climate Public Expenditure and Institutional Review (CPEIR)*. New York: UNDP. Available at https://www.undp.org/content/dam/rbap/docs/Research%20&%20Publications/democratic_governance/RBAP-DG-2015-CPEIR-Methodological-Guidebook.pdf.
- . 2018. Experiencias en la aplicación de la metodología de Análisis del Gasto Público e Institucionalidad para el Cambio Climático (CPEIR) en Honduras, Colombia, Chile, Ecuador y El Salvador. New York: UNDP. Available at https://www.latinamerica.undp.org/content/rblac/es/home/library/environment_energy/experiencias-en-la-aplicacion-de-la-metodologia-de-analisis-del-.html.
- . 2019. *Climate Change. Knowing what you spend. A guidance note for governments to track climate finance in their budgets*. New York: UNDP.
- United Nations Environment Programme. 2008. *Sustainable Procurement: Buying for a Better World*. Nairobi: UNEP. Available at http://www.greeningtheblue.org/sites/default/files/Buyingforabetterworld_0.pdf.
- United Nations Framework Convention on Climate Change. 2015. Acuerdo de París. New York: UNFCCC. Available at https://unfccc.int/files/meetings/paris_nov_2015/application/pdf/paris_agreement_english_.pdf.
- . 2016. Aggregate effect of the intended nationally determined contributions: an update. New York: UNFCCC. Available at <https://unfccc.int/resource/docs/2016/cop22/eng/02.pdf>.
- . 2018. Summary and recommendations by the Standing Committee on Finance on the 2018 Biennial Assessment and Overview of Climate Finance Flows. New York: UNFCCC. Available at <https://unfccc.int/sites/default/files/resource/51904%20-%20UNFCCC%20BA%202018%20-%20Summary%20Final.pdf>.
- . n.d. Nationally Determined Contributions. New York: UNFCCC. Available at <https://unfccc.int/process-and-meetings/the-paris-agreement/nationally-determined-contributions-ndcs/nationally-determined-contributions-ndcs>.

- United Nations Office for Disaster Risk Reduction. 2011. *Revealing risk, redefining development. Global assessment report on disaster risk reduction*. Geneva: UNDRR. Available at <http://www.unisdr.org/we/inform/publications/19846>.
- , 2016. *Report of the open-ended intergovernmental expert working group on indicators and terminology relating to disaster risk reduction*. Geneva: UNDRR.
- , 2020. What is the Sendai Framework for Disaster Risk Reduction? Geneva: UNDRR. Available at <https://www.undrr.org/implementing-sendai-framework/what-sendai-framework>.
- United States Global Change Research Program. 2018. *Impacts, Risks, and Adaptation in the United States: Fourth National Climate Assessment, Volume II* [Reidmiller, D.R., C.W. Avery, D.R. Easterling, K.E. Kunkel, K.L.M. Lewis, T.K. Maycock, and B.C. Stewart (eds.)]. Washington, D.C.: USGCRP.
- Viteri Andrade, A. 2019. *Impacto económico y laboral del retiro y/o reconversión de unidades a carbón en Chile*. Available at <http://dx.doi.org/10.18235/0001960>.
- Vogt-Schilb, A. and K. Feng. 2019. *The Labor Impact of Coal Phase Down Scenarios in Chile*. Washington, D.C.: IDB. Available at <http://dx.doi.org/10.18235/0001961>.
- Vogt-Schilb, A., B. Walsh, K. Feng, et al. 2019. *Cash Transfers for Pro-Poor Carbon Taxes in Latin America and the Caribbean*. Washington, D.C.: IDB. Available at <http://dx.doi.org/10.18235/0001930>.
- Whitley, S., L. van der Burg, J. Skovgaard, and H. van Asselt. 2018. Reforming Fossil Fuel Subsidies: The Art of the Possible. *The Politics of Fossil Fuel Subsidies and their Reform*, 47-65.
- World Bank. 2014. *Climate Change Public Expenditure and Institutional Review Sourcebook*. Washington, D.C.: World Bank.
- , 2020a. Climate Change Expenditure Tagging: An overview of current practices. Washington D.C.: World Bank. Check title (see editor's notes to team).
- , 2020b. *Global Economic Prospects*. Available at <https://www.worldbank.org/en/publication/global-economic-prospects>.
- , 2020c. COVID-19 to Plunge Global Economy into Worst Recession since World War II. Washington, D.C.: World Bank. Available at <https://www.worldbank.org/en/news/press-release/2020/06/08/covid-19-to-plunge-global-economy-into-worst-recession-since-world-war-ii>.
- World Resources Institute. 2008. *Bottom Line on Carbon Taxes*. Washington, D.C.: WRI. Available at <https://www.wri.org/publication/bottom-line-carbon-taxes>.



