



LATIN AMERICA  
AND CARIBBEAN

# DOMINICAN REPUBLIC

World Bank Group

# COUNTRY CLIMATE AND DEVELOPMENT REPORT

November 2023



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## Abbreviations

<b>AAL</b>	Annual Average Loss
<b>ABA</b>	Multiple Banks Association of the Dominican Republic
<b>AFOLU</b>	Agriculture, Forestry and Other Land Use
<b>ASP</b>	Adaptive Social Protection System
<b>BaU</b>	Business-as-Usual Scenario
<b>BELA</b>	Ecosystem-Based Landscape Assessment (initiative)
<b>BEV</b>	Battery Electric Vehicles
<b>CCDR</b>	Country Climate and Development Report
<b>CCRIF</b>	Caribbean Catastrophe Risk Insurance Facility
<b>CCS</b>	Carbon Capture and Storage
<b>CDEEE</b>	Dominican Corporation of State Electrical Companies ( <i>Corporación Dominicana de Empresas Eléctricas Estatales</i> )
<b>CGE</b>	Computable General Equilibrium (model)
<b>CIF</b>	Climate Investment Fund
<b>CNE</b>	Comisión Nacional de Energía (National Commission of Energy)
<b>CONEP</b>	National Council of the Private Sector ( <i>Consejo Nacional de la Empresa Privada</i> )
<b>COVID-19</b>	Coronavirus Disease 2019
<b>CPAT</b>	Climate Policy Assessment Tool
<b>CSF</b>	Climate Support Facility
<b>DGAPP</b>	General Directorate of Public-Private Partnerships ( <i>Dirección General de Alianzas Público-Privadas</i> )
<b>DR</b>	Dominican Republic
<b>DRM</b>	Disaster Risk Management
<b>EDAN-A</b>	Environmental Damage and Needs Assessment Guide
<b>ERT</b>	Enhanced Environmentally Related Taxation
<b>ESG</b>	Environmental, Social and Governance (framework)
<b>EV</b>	Electric Vehicles
<b>FDI</b>	Foreign Direct Investment
<b>ADF</b>	French Development Agency ( <i>Agence Française de Développement</i> )
<b>FIMOVIT</b>	Mobility and Transportation Trust Fund ( <i>Fideicomiso de Movilidad y Transporte</i> )
<b>GCF</b>	Green Climate Fund
<b>GDP</b>	Gross Domestic Product
<b>GHG</b>	Greenhouse Gas
<b>Gg</b>	Gigagram
<b>HEV</b>	Hybrid Electric Vehicle
<b>ICT</b>	Information and Communication Technology
<b>IDA</b>	International Development Association
<b>IDB</b>	Inter-American Development Bank
<b>IFC</b>	International Finance Corporation
<b>INTRANT</b>	National Institute of Transit and Land Transportation ( <i>Instituto Nacional de Tránsito y Transporte Terrestre</i> )
<b>IPPU</b>	Industrial Processes and Product Use
<b>IQR</b>	Interquantile Range
<b>ISCO</b>	International Standard Classification of Occupations
<b>IVACC</b>	Index of Vulnerability to Climate Shocks ( <i>Índice de Vulnerabilidad ante Choques Climáticos</i> )
<b>L&amp;D</b>	Loss & Damage
<b>LAC</b>	Latin America and the Caribbean
<b>LTS</b>	Low-Carbon and Resilient Development Strategy

<b>LULUCF</b>	Land Use, Land-Use Change and Forestry
<b>m<sup>3</sup></b>	Cubic Meters
<b>MANAGE</b>	Mitigation, Adaptation and New Technologies Applied General Equilibrium (model)
<b>MARENA</b>	Ministry of Environment and Natural Resources ( <i>Ministerio de Ambiente y Recursos Naturales</i> )
<b>MEM</b>	Ministry of Energy and Mines (Ministerio de Energía y Minas)
<b>MEPyD</b>	Ministry of Economy, Planning and Development ( <i>Ministerio de Economía, Planificación y Desarrollo</i> )
<b>MRV</b>	Monitoring, Reporting and Verification
<b>MIGA</b>	Multilateral Investment Guarantee Agency
<b>NAMAs</b>	Nationally Appropriate Mitigation Actions
<b>NBS</b>	Nature-Based Solutions
<b>NBT</b>	Nature-Based Tourism
<b>NCCC</b>	National Council for Climate Change
<b>NDC</b>	Nationally Determined Contribution
<b>NDS</b>	National Development Strategy
<b>NGO</b>	Non-Profit Organization
<b>NPSP</b>	National Multi-Year Public Sector Plan ( <i>Plan Nacional Plurianual del Sector Público</i> )
<b>NPV</b>	Net Present Value
<b>NZP</b>	Net Zero Pathway
<b>ODA</b>	Official Development Assistance
<b>OECD</b>	Organization for Economic Co-operation and Development
<b>PIT</b>	Personal Income Tax
<b>PNACC</b>	National Climate Change Adaptation Plan
<b>PPPs</b>	Public-Private Partnership
<b>RE</b>	Renewable Energy
<b>REDD+</b>	Reducing Emissions from Deforestation and Forest Degradation
<b>RST</b>	Resilience and Sustainability Trust
<b>SAIDI</b>	System Average Interruption Duration Index
<b>SAIFI</b>	Average Monthly Interruption Frequency Index
<b>SBFN</b>	Sustainable Banking and Finance Network
<b>SDG</b>	Sustainable Development Goal
<b>SEZ</b>	Special Economic Zone
<b>SIE</b>	Superintendency of Electricity ( <i>Superintendencia de Electricidad</i> )
<b>SIMV</b>	Superintendency of the Securities Market of the Dominican Republic ( <i>Superintendencia del Mercado de Valores de la República Dominicana</i> )
<b>SINAP</b>	National System of Protected Areas ( <i>Sistema Nacional de Áreas Protegidas</i> )
<b>SIREDA</b>	Damage Assessment and Evaluation System
<b>SIUBEN</b>	Single System of Beneficiaries ( <i>Sistema Único de Beneficiarios</i> )
<b>SLR</b>	Sea-Level Rise
<b>SSP</b>	Shared Socioeconomic Pathway
<b>TC</b>	Tropical Cyclone
<b>UNDP</b>	United Nations Development Programme
<b>UNFCCC</b>	United Nations Framework Convention on Climate Change
<b>VAT</b>	Value-Added Tax
<b>VRE</b>	Variable Renewable Energy
<b>WASH</b>	Water, Sanitation and Hygiene
<b>WSS</b>	Water Supply and Sanitation

## Acknowledgments

The Dominican Republic Country Climate and Development Report (CCDR) was a collaborative effort of the World Bank, IFC, and MIGA under the leadership and guidance of Anna Wellenstein and Benoit Bosquet (Regional Directors Sustainable Development, World Bank), Robert Taliercio and Oscar Calvo-Gonzalez (Regional Directors Equitable Growth, Finance and Institutions, World Bank), Maria Marcela Silva (Regional Director for Infrastructure, World Bank), Martin Spicer and Elizabeth Ann Marcano (Regional Directors, IFC), Merli Baroudi (Director, MIGA), Michel Kerf (Country Director, World Bank), Genevieve Connors (Practice Manager, World Bank), Doerte Doemeland (Practice Manager, World Bank), Stephanie Gil and Gabriela Elizondo Azuela (Practice Managers), Alexandria Valerio (Resident Representative, Dominican Republic) and Tatiana Nenova (Regional Manager, IFC). The team is grateful to Carlos Rodriguez Castelan (Practice Manager), Adrian Fozzard and Alberto Leyton (Practice Managers), Carmen Amaro (Operations Officer), David Treguer (Program Leader), Pedro Rodriguez (Program Leader), and David Vilar (Program Leader), who provided critical guidance and comments to the team at various stages.

The CCDR team was led by Katharina Siegmann (Senior Environmental Specialist), Gabriel Roberto Zaourak (Senior Economist), and Huong Mai Nguyen (Senior Energy Specialist). The core team included Nicholas Menzies (Senior Governance Specialist), Sara Diane Turner (Economist), Carol Franco (Climate Change Specialist), Ana Karla Perea Blazquez (Climate Change Specialist), José Carlos Fernandez (Climate Change Lawyer), Mariana González Sañudo (Economist), Carmina Quiroga (Economist), and Paola Brens Ortega (Economist). The team would also like to thank Julie Rozenberg (Senior Economist), Nancy Lozano (Lead Economist), Juan Jose Miranda Montero (Senior Environmental Economist), and James Sampi (Economist) for their continuous support throughout the development of this report.

A series of background papers and deep dives generated the information featured in this report. The CCDR team is thankful for the deep engagement of the following team members who contributed to preparing this report and for their guidance: Julian Barazi (Economist), Martin Aaroe Christensen (Senior Economist), Tom Remy (Energy Specialist), Miguel Luis Delgado Heleno (Energy Modeler), Tais Fonseca De Medeiros (Transport Specialist), Alejandro De la Fuente (Senior Poverty Economist), Daniel Valderrama Gonzalez (Poverty Economist), Lukas Andres Delgado Prieto (Consultant), Faruk Miguel Liriano (Financial Sector Specialist), Beulah Chelva (Economist), Esteban Ferro (Consultant), Paulina Estela Schulz Antipa (Consultant), Daniel Esteban Bastidas Cordova (consultant), Maria Elena García Mora (Senior Social Development Specialist), Rosa Maria Martinez (Senior Social Development Specialist), Ana I. Aguilera (Social Development Specialist), Ingrid Schreuel (Social Development Specialist), Gonzalo Pons (Consultant), Lilian Pedersen (Consultant), Marcos Morales (Consultant), Paola Guerra (Consultant), José Cuesta (Lead Economist), Paola Ballon (Senior Economist), Bouke Thomas Bernard (Consultant), Asyl Undeland (Senior Social Development Specialist), Viviane Wei Chen (Senior Climate Change Specialist), Liang Cai (Consultant), Bryan Jones (Consultant), Craig Kullmann (Senior Water Supply and Sanitation Specialist), Miguel Solanes (Consultant); Chloe Oliver Viola (Senior Water Supply and Sanitation Specialist), Marie-Laure Lajaunie (Lead Water Resources Management Specialist), Christophe Prevost (Senior Water Supply and Sanitation Specialist), Christian Borja-Vega (Senior Economist), Luis Nicholas Loyola (Senior Irrigation and Drainage Specialist), Barbara Farinelli (Senior Agriculture Economist), Cristian A Herrera (Senior Health Specialist), Harry Edmund Moroz (Economist), Ursula Milagros Martinez Angulo (Social Protection Specialist), Miriam Montenegro (Senior Social Protection Specialist), Tomas Plaza Reneses (ET Consultant), Josef S. Trommer (Senior Operations Officer), Victoria Alexeeva (Disaster Risk Management Specialist), and Anna-Maria Bogdanova (Disaster Risk Management Specialist).

The report also benefited from the inputs of IFC colleagues, particularly Pablo Andres Salas (Senior Economist) and Samuel Rosenow (Economist, Economic Policy Research), and comments from MIGA colleagues, particularly Bexi Jimenez Mota (Senior Risk Management Officer) and Susan Vasquez Plasencia (Risk Management Officer).

The team benefited immensely from the guidance of three peer reviewers—Lauren Claire Culver (Senior Energy Specialist), Kevin Carey (Program Manager), and Ashwini Rekha Sebastian (Senior Agriculture Specialist).

Industrial Economics conducted background analysis that provided important inputs to the CCDR. The report benefited from key studies on natural capital and climate finance where funding was provided by the Climate Support Facility (CSF) and the Climate Investment Fund (CIF), respectively. Support from PROGREEN-funded Biodiversity, Ecosystem-Based Landscape Assessment (BELA) initiative is also appreciated.

The team is grateful to Maria Hermann (Executive Assistant), Alexandra Soto Ortiz (Program Assistant), and the entire DR country office's Administrative and Client Support team, who made all the necessary arrangements for the many mission meetings and provided critical administrative support.

Finally, the team would like to emphasize its sincere gratitude for the excellent contributions received from representatives of the Dominican Republic authorities. Throughout the process, the team benefited from extensive feedback and contributions from the Ministry of Economy, Planning and Development (MEPyD) the Ministry of Energy and Mines, the Ministry of Environment and Natural Resources (MARENA), the Ministry of Finance, the Ministry of Agriculture, the National Energy Commission, the National Council for Climate Change and Clean Development Mechanism, the National Institute for Water Resources (INDRHI), and the Ministry of Tourism. The team also would like to acknowledge the valuable inputs it received from Fundación Popular and Fundación Plenitud to finalize this report.

## Executive Summary

**The 2030 National Development Strategy (NDS) of the Dominican Republic (DR) offers an ambitious vision for the country, putting development and climate at the center.** The Strategy lays out a path to the creation of a society based on sustainable production and consumption. It aims to manage risks and protect the environment and natural resources, while ensuring equity and efficiency. In addition, the Strategy emphasizes the need to provide essential services such as good-quality education, healthcare, housing, and basic services, in the context of climate adaptation and the decarbonization of the economy. The DR has also included in its updated Nationally Determined Contribution (NDC) the intention to achieve carbon neutrality by 2050 and has begun to develop a long-term strategy to complement its NDC.

**To achieve these objectives, the country will need to navigate two economic transitions.** Because of its geographical position and island status, the country is highly vulnerable to natural shocks such as floods, storms, and hurricanes, which exact high human and economic losses. The country is also increasingly vulnerable to slow-onset changes, mainly from rising temperatures and sea levels. The first transition the DR will need to manage therefore is to become a more climate-resilient economy to reduce its exposure to the expected macroeconomic, poverty and distributional impacts of climate change. Secondly, to achieve its development and climate goals, the DR economy will need to make a structural transition from carbon-positive emissions to carbon neutrality.

**Despite significant progress in boosting economic growth and reducing poverty, the DR will face challenges in navigating these economic transitions and achieving its development objectives.** *First*, while high and stable economic growth has led to social progress, significant work remains to achieve inclusive and equitable development. *Second*, enhanced productivity is needed to reinvigorate growth and make sustained gains in living standards and poverty reduction. Lagging productivity has contributed to depressed real wages in a country that already has high regional disparities, and that will require greater market competition, improved human capital, and more innovation to speed growth. *Third*, the DR faces limited fiscal space in which to step up public investment. This is crucial not just for bridging the gaps in infrastructure, but also to meet social demands, including equitable access to basic services such as healthcare and education. *Fourth*, important sectors such as water, agriculture, and tourism are highly dependent on increasingly scarce natural resources such as water, timber, and land, and unsustainable practices have led to environmental degradation. These sectors, together with energy (including transport), are critical sources of pollution and carbon emissions, and increasingly uncompetitive. Furthermore, the high cost of energy along with power outages impact businesses and hamper competitiveness, as well as disproportionately affecting poor and vulnerable households.

**Despite the government's efforts and commitment, climate change is likely to compound some of the country's development challenges and, in the absence of adaptation efforts, the projected climate impacts will affect economic activity, poverty reduction, and growth.** Disasters caused by natural hazards will likely increase, with tropical storms the most frequent. Climate projections indicate higher-intensity windspeed, storm surge and floods associated with tropical storms, as well as a likely increase in the number of hot days (35 °C+), along with sea-level rise. By 2050, climate change impacts are expected to decrease labor productivity and affect health, crop yields, tourism, infrastructure, and natural ecosystems such as forests and coastal areas. The modeling conducted for this report suggests that climate-induced GDP deviations from the baseline scenario could reach up to 16.7 percent of GDP by 2050.<sup>1</sup> Of this, more than 80 percent of the loss comes from three channels: reduced labor productivity caused by heat stress, more tropical storms, and reduced tourism demand. Climate change will also affect the country's poverty reduction efforts. Estimates show that by 2050 the poverty rate will be between 0.7–1.2 percentage points higher compared to business as usual because of climate change impacts. That is, 16–25 percent more

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<sup>1</sup> The baseline scenario is a projection until 2050 without any climate change damage. The model compares GDP to what it would have been without the impacts of climate change.

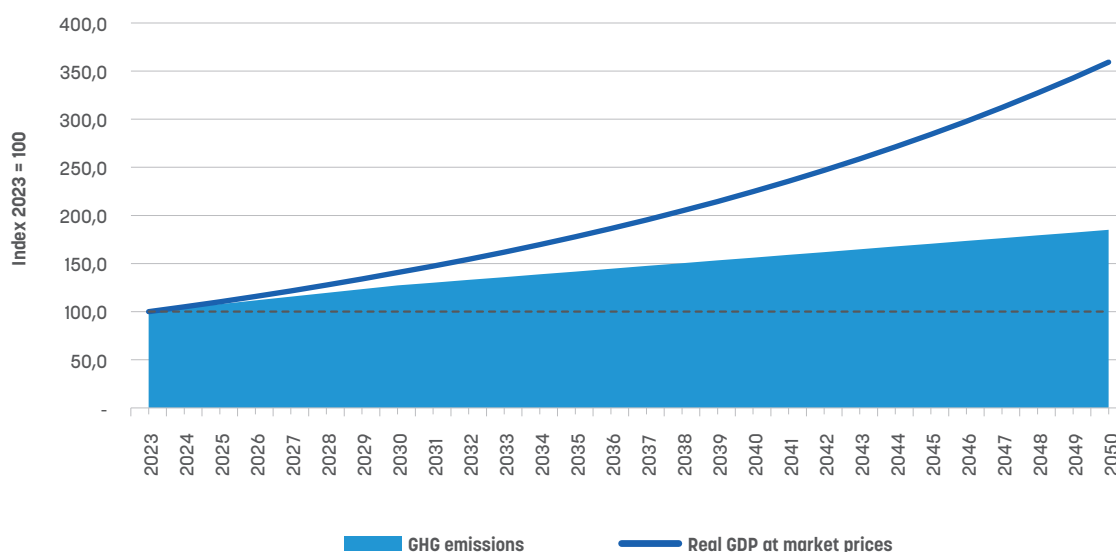


people will live in poverty by 2050 compared to a scenario in which climate change didn't occur.<sup>2</sup> Climate change impacts, compounded by natural resource degradation and limited access to basic services, are also expected to affect migration patterns and vulnerable populations.

**Although the DR has a small carbon footprint, the persistently steady rise in emissions threatens the country's climate neutrality goal (figure ES-1).** In 2019, emissions were 3.70 t CO<sub>2</sub>eq/capita, significantly lower than both the world (6.48 CO<sub>2</sub>eq/capita) and the Latin America and the Caribbean (LAC) (6.28 tCO<sub>2</sub>eq/capita) averages. However, in the 2010–2015 period, emissions had increased by 18.85 percent, driven mainly by the energy, waste, and agriculture sectors. In the energy sector, electricity generation emitted the most GHGs, followed by transport. The land use sector consistently absorbed more CO<sub>2</sub> than it emitted, but removals decreased by 14 percent over the same period.

**In both the short and long terms, the DR would gain from accelerating the implementation of decarbonization measures.** Without enhanced decarbonization measures, emissions are expected to rise at a slower pace than economic growth as the structure of the economy shifts toward services, which are less intensive in GHG emissions, and as the country's energy matrix becomes greener.<sup>3</sup> To address the country's emissions, the main measures are to i) accelerate the shift to a greener power mix; ii) electrify buildings, transport, and industrial processes; iii) maintain and enhance the country's carbon sink through improved practices in the agriculture, forests, and land use sectors; and iv) reduce emissions in the waste sector. Decarbonization can improve the economy's resilience because heavy dependence on fuel imports is a major source of balance of payments risk and potentially of price instability, as occurred between 2021 and 2022. Mitigation actions will lower pollution, improve biodiversity protection, enhance public health, and help create green jobs in the agriculture, energy (including transport), tourism and waste sectors.

**FIGURE ES-1.** Emissions path in the baseline scenario compared to real GDP



Source: World Bank staff estimates (2023).

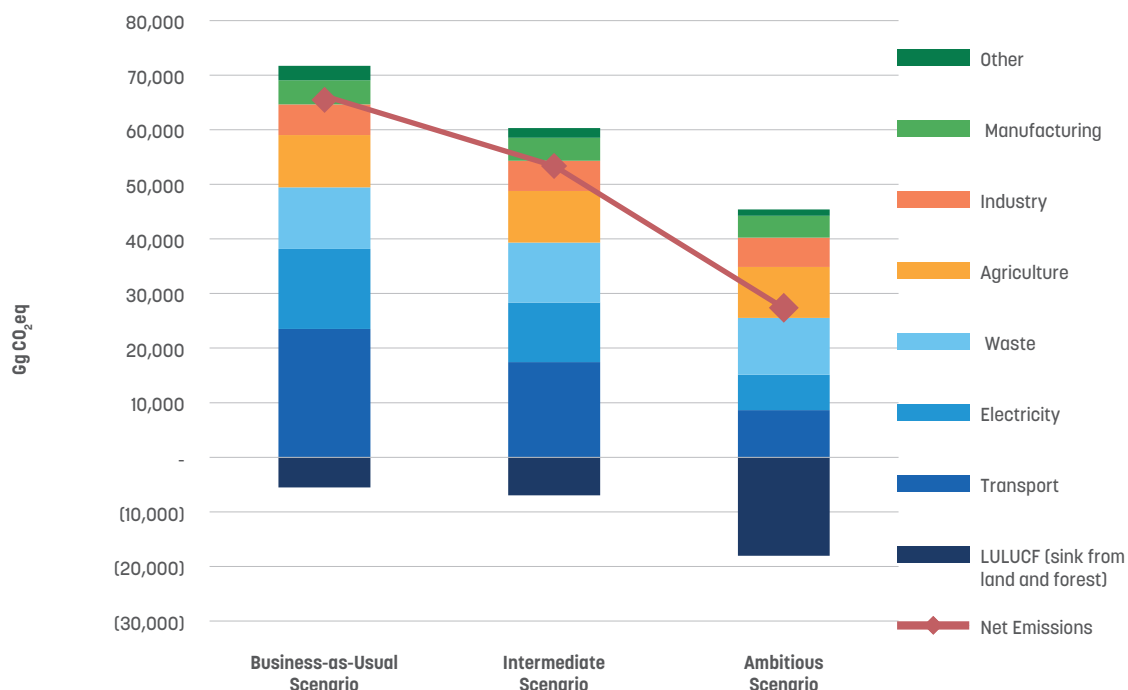
**To achieve climate neutrality by 2050, the country will need to adopt even more ambitious reforms.** Even after undertaking ambitious sectoral reforms, total emissions in 2050 are modelled to be 27.36 MtCO<sub>2</sub>e (figure ES-2). To reach net zero, enhanced decarbonization efforts for the energy sector (power and transport) will need to be complemented by reforms in other sectors, including waste, and additional measures in

<sup>2</sup> In this report, different sets of scenarios are used and combined i) GDP growth scenarios; ii) climate scenarios describing global climate scenarios and their impact on the DR, (sections 1.1 and 1.2); iii) adaptation scenarios reflecting the level of ambition of DR's adaptation measures (section 3.1); and iv) mitigation measure scenarios showcasing the level of decarbonization related to sets of mitigation measures (section 3.2).

<sup>3</sup> The baseline scenario assumes that the energy matrix has some transitions toward cleaner generation. All the additional scenarios assume investments relative to the baseline, which translates to a faster energy transition.

forestry and agriculture. Sectoral reforms will also need to be combined with economy-wide measures (for example, carbon pricing). Expected future decreases in the costs of green technologies could speed up the trajectory of decarbonization, complementing policy reform actions. The DR will also need to ensure a just transition amidst decarbonization efforts, prioritizing the protection of its most vulnerable and at-risk communities, especially workers whose jobs, and regions whose local economies will be at risk.

**FIGURE ES-2. Decarbonization by sector<sup>4</sup>**



Source: World Bank staff elaboration using MANAGE model (2023).

**Investments for resilient, low-carbon development will have substantial costs but will also generate significant economic, environmental, and social benefits.** This CCDR estimated additional investment needs for resilient, low-carbon development based on the ambitious decarbonization scenario (table ES-1). Investment needs were calculated as the 2022 present value of the investment flows up to either 2030 or 2050, discounted with an interest rate of 6 percent, and then expressed as a share of the discounted present value of GDP to either 2030 or 2050. The analysis shows that new power infrastructure requires in investments worth 1.1 percent of GDP by 2050 in the ambitious scenario. Similarly, transport decarbonization investment costs are estimated at 1.1 percent of cumulative GDP, including hybrid electric vehicles (HEVs), battery electric vehicles (BEV), and modal shift. While both investments are costly, the economic benefits of the two together outweigh their long-term costs because of their outsized contributions (of 80 percent) to total avoided emissions, reduced fuel costs and road damage, and reductions in deaths from improved air quality. Because of constraints related to the country's island status, the energy sector (power and transport) cannot itself reach net zero without interconnecting with a bigger, reliable, and cleaner grid that would serve as a backup to its electricity system and safeguard the power needed for growth. The analysis also found that mitigation investments in land and forests will cost 0.02 percent of cumulative GDP by 2050 and provide relatively large emissions reductions both by 2030 and 2050, in addition to serving as a carbon sink<sup>5</sup> that will help bring the entire economy closer to net zero by 2050. These interventions also bring small net-positive economic benefits valued relative to other potential land uses, such as grazing (0.1 percent of cumulative

<sup>4</sup> Emissions in a billion metric ton (Mt) CO<sub>2</sub>eq.

<sup>5</sup> For example, through the adoption of conservation tillage. See S. Hussain, S. Hussain, R. Guo, M. Sarwar, X. Ren, D. Krstic, Z. Aslam, et al. "Carbon Sequestration to Avoid Soil Degradation: A Review on the Role of Conservation Tillage," *Plants (Basel)* 10, no. 10 (September 2021): 2001, <https://doi.org/10.3390/plants10102001>; J. Quinton, L. University, G. Govers, K.U. Leuven, K. Van Oost, U.C. Louvain, R. Bardgett. "The Impact of Agricultural Soil Erosion on Biogeochemical Cycling," *Nature Geosci.* 3 (May 2010): 311–314, <https://doi.org/10.1038/ngeo838>.

GDP by 2050).<sup>6</sup> Therefore the positive cost benefit relationship of mitigation focuses on measures for land use that can be competitive against other alternatives that might put at risk the long term sustainability of the country's forest and land productivity.

**Resilience-enhancing investments by 2050 require resources of at least 1.6 percent of cumulative GDP.** However, they would bring significant economic benefits associated both with the direct reduction of damage (net economic benefits of 3.4 percent of cumulative GDP by 2050 from averted capital damages) and with economic multiplier effects and wider social benefits, not all of which are quantifiable in the context of the DR. Investments in adaptation measures, including changed times for outdoor labor, minimizing urban heat islands and expanded cooling to reduce labor stress<sup>7</sup> result in a 50 percent reduction in labor productivity loss in the service sector and a 58 percent reduction in productivity loss in industry by 2050. Crop resilience investments result in absolute gains to agricultural productivity in the short term (to 2030), and near-complete amelioration of climate impacts out to 2050 with a 97 percent reduction in yield losses. Unmet demand for municipal and industrial water declines by 12.3 percent annually by 2030, before increasing slightly to a 7.7 percent reduction in annual losses by 2050 as climate impacts accelerate. However, these estimations represent only a subset of the investment needed for adaptation and resilience. The cost and benefit NPV calculations provided herein are based on current assumptions, estimates, and projections and involve significant elements of judgment and analysis. Users should be aware that NPV calculations are inherently predictive and are subject to uncertainties and contingencies, and future developments might affect the calculations, including related to project implementation, technological innovation and state capacity. They should also be considered as both complementary to other estimations and subject to high uncertainty.

**TABLE ES-1.** Additional investment needed for resilient, low-carbon development

	Accumulated Emissions Reductions (MtCO <sub>2e</sub> )		Investment Costs (% Cumulative GDP)		Investment Costs (Million 2022 USD)		Total Benefits (% Cum. GDP)		Net Benefits (% Cum. GDP)	
	By 2030	By 2050	By 2030	By 2050	By 2030	By 2050	By 2030	By 2050	By 2030	By 2050
<b>Combined Power/Transport</b>	14	221	1.0%	2.2%	7,660	38,037	0.4%	2.3%	-0.6%	0.1%
Power	10	207	0.3%	1.1%	5,221	18,399	0.2%	0.9%	-0.1%	-0.2% <sup>8</sup>
Transport	4	14	0.7%	1.1%	2,439	19,638	0.2%	1.3%	-0.5%	0.3%
<b>AFOLU<sup>^</sup></b>	23	57	0.0%	0.0%	215	417	0.1%	0.1%	0.1%	0.1%
<b>Tropical cyclone/SLR</b>	-	-	1.5%	1.6%	11,689	2,3980	2.1%	5.0%	1.4%	3.4%

Source: World Bank estimations based on ambitious scenario using inputs from sectoral transport and energy models, and the calculation of impact channels (see annex 2, 3 and 4).

Notes: \* Gross investment needs estimated with a 6 percent discount rate. <sup>^</sup>Agriculture investments total \$291 million in 2030 and \$658 million by 2050 but are not explicitly incorporated into the macro model. Benefits monetized include avoided emissions, avoided fuel use, and for transport and power, reduced mortality from improved air pollution, fewer accidents, or less road damage for transport. For Agriculture, Forestry and Other Land Use (AFOLU), the benefits relative to other potential land uses is used for net benefit.

**Current expenditures illustrate the scale of the investments needed for a resilient and low-carbon development path.** For the first time, the 2023 budget tags climate-related spending, including expenditures with both a positive and negative impact on climate change. In 2023, expenditures (US\$1.35 billion) on climate change-inducing activities were 1.8 times greater than climate-friendly spending (US\$760 million). These current expenditures can be compared to the investments estimated in the CCDR analysis. Annual discounted investments in resilient, low-carbon development would average 4.7 percent of GDP every year from 2023 to 2050 (approximately US\$6.7 billion per year, in 2022 dollars), assuming full public financing.

<sup>6</sup> They can also provide important ecosystem service benefits in terms of water cycle regulation, water quality, erosion reduction, flood mitigation, and biodiversity.

<sup>7</sup> Please consult annex 2 for details on adaptation measures included.

<sup>8</sup> This includes the significant electricity requirements associated with the aggressive electrification of transport.

This is approximately eight times larger than the current public budget allocation for positive climate action. Substantial public sector financing will therefore need to mobilize even more significant private capital investments.

**Policy measures and investments in adaptation and resilience can reduce the economic impacts of climate change and protect people and infrastructure.** Increasing resilience and adaptation capacity are a priority for the DR, considering the significant impacts of climate change and the country's vulnerability. The modeling conducted for this report suggests that the adoption of measures to reduce direct damage from erosion on crop production, inland flooding, sea-level rise, and tropical storms could reduce the potential macroeconomic impacts by up to 10 percentage points. This reduction equals a 60 percent reduction in climate impacts by 2050. Additional benefits can be obtained if the DR protects its workers against high heat stress, enhances its disaster resilience and adopts nature-based solutions (NBS). These measures can ameliorate climate impacts, raise economic productivity, and provide development and environmental benefits while protecting those potentially affected by the policies.

**A net-zero resilient pathway for DR would require substantial public and private sector investments by 2050, as well as maintaining existing fiscal prudence.** The required extra funding from both private and public sectors is estimated to range from 1.2 to 2.2 percent of GDP. The government should foster private investment to fund about 70% of the transition costs, estimated at 1.1–2% of GDP. Revenue mobilization through tax base broadening and spending efficiency improvements, including procurement and utility subsidy reforms, could yield an additional 0.4% of GDP. Implementing a carbon tax could generate further revenues of about 0.8% of GDP, aiding in a shift towards lower emissions, as outlined in table ES-2 of the CCDR. Compensation measures for the poor against negative impacts, like increased energy costs from the carbon tax, might require 0.3% of GDP.

**TABLE ES-2.** Navigating the climate transition: A funding strategy for the Dominican Republic (as a percentage of GDP)

	2023–2030	2031–2050
<b>Total Public and Private</b>	<b>2.2</b>	<b>1.2</b>
<i>Public Sector (A - B)</i>	<b>0.2</b>	<b>0.1</b>
<i>(A) Climate transition costs</i>	<b>1.4</b>	<b>1.0</b>
Additional Climate Investment	0.7	0.4
Tourism Revenue Loss	0.5	0.5
Social Protection	0.2	0.1
<i>(B) Revenue and expenditure changes</i>	<b>1.2</b>	<b>0.9</b>
Carbon Prices	0.8	0.8
Subsidies	0.3	0.1
Spending Efficiencies	0.1	0
Additional Revenue Measures	0.3	0.3
Measures to Mitigate the Effect of Carbon Prices and Subsidies	-0.3	-0.3
<i>Private Sector</i>	<b>2.0</b>	<b>1.1</b>
Additional Revenue Measures	2.0	1.1

Source: World Bank staff elaboration (2023).

**Achieving the Dominican Republic's ambitious climate and development objectives will require cross-cutting measures across multiple dimensions.** The government operates in a constrained environment, which results in a lack of fiscal space to simultaneously meet the need for social programs, environmental protection, and better infrastructure. As a result, effective cross-cutting action will need support from the private sector to ensure implementation at scale. The following six recommendations include actions that have particularly large and wide-ranging benefits, address bottlenecks in critical sectors, and serve as preconditions for implementing future measures.

1. **Strengthening institutions and governance.** There are gaps, overlaps and ambiguities in the existing policy and institutional architecture for climate action, which sometimes present barriers to government coordination and can undermine implementation across all sectors.
  - **Reforms that would strengthen the government's capacity for climate action by supporting the establishment of a shared set of government priorities include** i) developing a climate change framework law that anchors long-term targets, clarifies institutional mandates, and establishes a hierarchy of strategies and plans; ii) developing a long-term decarbonization and resilience strategy that creates sectoral milestones up to 2050; and iii) enhancing coordination between government entities, including local governments.
  - **Additional governance and institutional reforms that can help ease implementation frictions by providing crucial information and aligning priorities with budgetary capacity include** i) boosting policy implementation capacity with a focus on incorporating climate risk in planning and investment; ii) increasing the availability of geographically disaggregated data, including climate risk information to inform government, firm and household decision making; iii) aligning public finances with climate priorities through better use of the national budget and screening of public investments for climate risks; and iv) enhancing public knowledge of climate change and developing capacity for independent expert advice.
  
2. **Macroeconomic management, fiscal, competitiveness, jobs, and social protection.** The government faces the challenge of carving out additional fiscal space in an economy that is already burdened by structural development difficulties.
  - **Improvements to fiscal and macroeconomic management will help create opportunities for spending to support accelerated implementation of climate and development goals.** Estimated losses in the fiscal accounts are expected to reach up to 19.7 percent of total general government revenues, relative to a business-as-usual scenario. Options the DR could consider include i) reassessing the tax system by reevaluating tax expenditures, revising corporate incentives, and reforming property taxes; ii) improving expenditure efficiency by rationalizing and reevaluating current subsidies such as for fuel; iii) introducing a carbon tax while protecting the poor; iv) developing a comprehensive disaster risk financing strategy that includes risk transfer and retention instruments, such as parametric insurance products, national and regional catastrophe credit lines, and bonds; and iv) minimizing fiscal risk exposure from natural disasters by creating a strategy for budget stability and financial protection.
  - **Climate change presents an opportunity to enhance competitiveness and pursue a diversification agenda.** For a small trade-dependent economy such as the DR, reliable road and port infrastructure is crucial to effectively establish functional domestic supply chains, boost productivity and competitiveness, and integrate firms in global value chains. The country needs to strengthen its contribution to green global value chains while enhancing the complexity of the export basket and the sustainability of value chains. To achieve this, DR will need to: i) increase productivity by stimulating competitive markets, revamping its innovation strategy, reducing barriers to access credit, and expanding digitization; and ii) pursue export diversification and increase the export participation of products with high value-added, including by attracting sustainable foreign direct investment in non-traditional sectors, and improving transport and logistics.
  - **Enhancing jobs and social protection by strengthening the productivity, flexibility, and innovative capacity of the labor force through** i) the implementation of policies that better align skills with market needs, for example, retraining programs that help truckdrivers transition into roles such as insulation workers; and ii) the development of active labor market programs to help workers transition away from environmentally unfriendly industries, and mitigate the geographic impacts of climate change on labor force. Building human capital in this way would also open up opportunities to create more jobs both in modern, high-skill-intensive industries, such as information, communication, and technology (ICT), and in less skill-intensive industries such as tourism, as well as additional green jobs.

- **Supporting these actions through efforts to build resilience across the population against future climate and economic changes by** i) providing targeted subsidies to cushion damage of environmentally friendly policies in affected populations (for example, poor households, firms), ii) strengthening Adaptive Social Protection (ASP) delivery systems by leveraging its connection with disaster risk management (DRM) systems, and supporting demonstration projects to build then evidence base for interventions that reduce labor heat stress (for example, active and passive cooling, changes to work practices, establishment of cooling centers, air conditioning, green roofs and tree planting).
- 3. The development of resilient, productive, and sustainable land use and agricultural systems requires a range of reforms and the adoption of new technologies and techniques.** Agriculture has been a core sector of the DR economy but unsustainable practices are contributing to deforestation in upper watersheds, soil erosion, and the pollution of water sources. The country simultaneously faces significant losses in the water sector, with agricultural irrigation representing 82 percent of water use.
- **Action should focus on establishing a set of technical tools and capacities by** i) developing agroecological/agroclimatic zoning information for key value chains to improve decision making and to support the development of agricultural risk management products; ii) strengthening the implementation capacity of institutions for agricultural management to provide technical assistance, knowledge exchange/transfer, and increased R&D for greater climate resilience; iii) supporting the adoption of climate-smart production measures for rice, other crops and livestock (for example, agroforestry) in order to reduce input intensity (for example, water) and negative environmental impacts; and iv) improving agricultural value chains, to reduce loss and increase efficiency.
  - **Actions to improve the sustainability of agriculture by reducing potential adverse impacts on other systems include** i) promoting an integrated territorial and landscape approach to agricultural infrastructure investments to help improve agriculture's resilience against extreme events and other climate impacts, prioritizing water resources; ii) improving the irrigation efficiency of agriculture (for example, by switching from gravity-fed irrigation to drop or sprinkler irrigation) to reduce unmet water demand and iii) establishing cost-effective monitoring and verification and value-chain traceability to ensure that agriculture contributes to achieving the DR's development goals across sectors.
  - **In the area of land use, actions can protect vulnerable carbon stocks by** i) advancing the quantifying of natural capital, implementing NBS, and estimating impacts to support improved resilience and risk reduction; and ii) and continuing to provide technical training at all levels, boost communication and benefit sharing, and push forward the Reducing Emissions from Deforestation and Forest Degradation (REDD+) agenda to support mitigation efforts and ecosystem services
  - **In the water sector, policy and institutional reforms that can enhance efficiency and reduce the harmful impacts of more variable, less predictable rainfall include** i) adopting and enforcing a law to separate water regulation from operations to ensure that water resources can be adequately managed; ii) strengthening the legal and regulatory framework for water service delivery (both water supply and sanitation (WSS) and irrigation) through the establishment of an effective system of state-issued water rights; iii) increasing reservoir volume through measures such as raising dams and reducing sedimentation to increase supply availability; iv) implementing and expanding WSS modernization programs; and v) building and publicizing the evidence base for water's economic importance in order to raise awareness of its value to livelihoods and quality of life.
- 4. Transitioning to a more resilient, low-carbon development path through sustained and concerted policy action, especially in the power and transport sectors.**
- **To create an enabling framework to reduce energy emissions the country should focus on the uptake and integration of renewable energy and the transition away from coal.** Identifying a set of technically, financially, socio-economically, and socially sound options to phase out coal use

and increase the use of cleaner fuels over time is a crucial priority that includes several associated tasks such as i) establishing regulations, remuneration systems, and other measures needed to incentivize battery adoption; ii) fully implementing the recently decreed competitive procurement of renewable energy projects; iii) coordinating transmission planning and investments to minimize constraints; iv) structuring costs and financial options for the conversion and repurposing of coal plants; v) conducting grid impact studies to specify a feasible timeline for the phase-out of each of the coal plants, and; vi) developing a social engagement plan and stakeholder management plan to support the affected communities during the transition away from coal.

- **At the same time, energy efficiency programs can reduce reliance on fossil fuels and mitigate demand increases from electrification. Steps to do this include** i) strengthening the regulatory framework for energy efficiency; ii) enforcing performance standards for equipment, vehicles, and buildings; iii) using public sector-led investments as a demonstration for energy efficiency; while iv) ensuring the adequacy of the electricity grid to accommodate additional demand from the large-scale adoption of EVs.
  - **Electrification of transport can bring many benefits but requires significant effort over a sustained period.** In the short term, transport sector policies to support the transition should focus on i) developing a clear roadmap for the adoption of EVs in urban transport; ii) building capacity and improving the coordination of urban transport projects and e-mobility transitions; iii) supporting fleet renewal by incentivizing the replacement of old vehicles and implementing stricter new and used vehicle standards, particularly for heavy cargo transport; and iv) implementing new mass-transit modes; v) upgrading the public vehicle fleet with electric and hybrid units; and vi) formalizing informal transport providers (conchos) to improve public transportation options in urban areas.
- 5. Across all sectors, improved resilience in the face of disasters is critical.** To improve disaster risk management, the country needs to i) adopt building code standards and investments for multi-hazard risks to improve infrastructure and to increase resilience against hazards; ii) improve the availability of data on natural hazards and risk exposure to support land use planning, risk assessment, and pricing of insurance products; iii) implement territorial planning reforms and the incorporation of DRM in land use planning to reduce population vulnerability, environmental degradation, and the cost of public service delivery; iv) assess investment opportunities in NBS for urban disaster resilience and tourism industry vitality (especially mangroves and corals).
- 6. Cross-cutting efforts are required to mobilize the private sector and develop financing options for these transitions.** A combination of innovations can help mobilize private capital to meet DR's climate- financing needs, including i) deepening the financial markets, tapping into sustainable finance, and leveraging public-private partnerships (PPPs); ii) fostering an inclusive financial sector, including savings, credit, and insurance, that is accessible to previously underserved households and firms, while also developing more affordable microinsurance products for low-income households; iii) enhancing infrastructure resilience and disaster risk financing by revamping risk management and investment strategies for tourism infrastructure and integrating climate risk management within emerging Environmental, Social and Governance (ESG) frameworks; and iv) adopting parametric insurance products, particularly for public services, industry, and agriculture, to mitigate the burden of contingent liabilities, and establishing better contingent funds to manage disaster-related financial impacts.

# 1. Climate and Development

## Main Messages

- The Dominican Republic has made significant progress in boosting economic growth and reducing poverty, but it still faces challenges to achieve inclusive and equitable development, increase productivity, and improve the competitiveness and sustainability of primary sectors like agriculture, water, tourism, and energy.
- The National Development Strategy (NDS) and the National Multi-Year Public Sector Plan (NPSP) aim to address development and climate challenges and promote a green, inclusive and resilient future.
- The DR is highly vulnerable to climate change, which is likely to compound existing development challenges. By 2050, climate change impacts are expected to decrease labor productivity (by between -3.5 and -9 percent) and affect health, crop yields (some of which are expected to experience shocks up to -30 percent of productivity), tourism, infrastructure capital (with an expected tripling of historic damage based on climate scenario), and natural ecosystems such as forests and coastal areas.
- Climate change also poses risks to the financial system such as the banking sector's heightened credit exposure to tropical cyclones and droughts.
- Although the DR has a small carbon footprint, the country's GHG emissions have been rising, mainly in the energy, waste, and agricultural sectors. Fostering a low-carbon growth path can support the country's climate change goals while bringing important development co-benefits.

## 1.1. Climate and development challenges

**Before the COVID-19 pandemic, the DR had two decades of high economic growth and poverty reduction, yet glaring inequalities persist.**<sup>9</sup> Over the last decade, the DR has been the second-fastest-growing economy in LAC, averaging 5.4 percent a year over the 2005–2022 period. Strong and stable economic growth led to some social progress: poverty (at a cutoff point of US\$5.5/day) fell by more than half, from 31 percent in 2002 to 12 percent in 2019, while the middle class (US\$13–70/day) expanded from 25 to 42 percent.<sup>10</sup> However, significant challenges persist to achieving inclusive and equitable development. Forty-four percent of the population remains vulnerable to economic shocks.<sup>11</sup> The top 1 percent of income earners receive almost one third of the national income and the top 10 percent receive more than the remaining 90 percent.<sup>12</sup> On gender inequality, the country ranked 106 out of 191 countries in the 2021 Gender Inequality Index of the United Nations Human Development Report,<sup>13</sup> mostly due to the poor political and economic participation of women.<sup>14</sup> Improvements in human

<sup>9</sup> World Bank, *Dominican Republic Country Economic Memorandum - Sustaining Economic Growth (English)* (Washington, DC: World Bank Group, 2023), <http://documents.worldbank.org/curated/en/099072523145018880/P1767091452d11731eea1143a418ae716718fe03a5af>.

<sup>10</sup> World Bank, *Dominican Republic Poverty Assessment 2023: Fast Tracking Poverty Reduction and Prosperity for All* (Washington, DC: World Bank, 2023), <http://hdl.handle.net/10986/40565>.

<sup>11</sup> World Bank, *Dominican Republic - Country Partnership Framework for the Period FY 22-26 (English)*. (Washington, DC: World Bank Group, 2022), <http://documents.worldbank.org/curated/en/366231649085796162/Dominican-Republic-Country-Partnership-Framework-for-the-Period-FY-22-26>.

<sup>12</sup> CEPAL (Comisión Económica para América Latina y el Caribe), *Desigualdad del Ingreso en la República Dominicana 2012-2019* (Santiago, Chile: CEPAL, 2022), <https://www.cepal.org/es/publicaciones/48242-desigualdad-ingreso-la-republica-dominicana-2012-2019-revision-partir-la>.

<sup>13</sup> UNDP, *Human Development Report 2021/2022: Uncertain times, unsettled lives: Shaping our Future in a transforming way* (2021), [https://hdr.undp.org/system/files/documents/global-report-document/hdr2021-22pdf\\_1.pdf](https://hdr.undp.org/system/files/documents/global-report-document/hdr2021-22pdf_1.pdf)

<sup>14</sup> UNFPA (United Nations Population Fund), *Country programme document for the Dominican Republic* (New York: UNFPA, 2022), [https://www.unfpa.org/sites/default/files/board-documents/DP.FPA.CPD.DOM\\_7%20-%20Dominican%20Republic%20CPD%20-%20DRAFT%20final%20-%202021Nov22.pdf](https://www.unfpa.org/sites/default/files/board-documents/DP.FPA.CPD.DOM_7%20-%20Dominican%20Republic%20CPD%20-%20DRAFT%20final%20-%202021Nov22.pdf).



development — such as learning outcomes, maternal mortality, and adolescent pregnancy— and in access to and the quality of basic services (electricity, water, and sanitation) have been slower than the pace of economic growth.

**Among the multiple development challenges the country faces, the following stand out:**

- » **Productivity that still lags economic growth.** The fast pace of economic growth has allowed per-capita income to converge steadily with the level of richer countries, reaching almost 30 percent of the United States' GDP per capita by 2022. However, to reduce the gap even further, the country will have to accelerate its productivity growth because, in recent years, growth has been driven by factor accumulation, mostly capital. Productivity growth has been stifled by a variety of obstacles, including limited competition and moderate levels of innovation, market distortions, and insufficient investment in human capital.
- » **Limited fiscal space to step up public investment.** The climate transition requires greater investment than what is currently available. Although most of it will come from the private sector, the public sector will also have to contribute as a catalyst, which implies generating more fiscal space. This is crucial not just for bridging gaps in infrastructure but also to meet social demands, including equitable access to basic services.
- » **Rapid urbanization and challenges in land use planning.** The DR is urbanizing at a fast rate (1.9 percent) —in 2020, 9.1 million people (82 percent of the population) resided in urban areas<sup>15</sup>— challenging the government's capacity to respond and leading to territorial inequality.<sup>16</sup> Approximately a third of the population lives in housing considered structurally vulnerable to natural hazards and climate-related events.<sup>17</sup> In highly urbanized areas, the percentage of informal and vulnerable housing is even higher. For example, in Greater Santo Domingo and Puerto Plata, approximately 43 percent and 70 percent of the population, respectively, live in informal settlements, respectively.<sup>18</sup> By 2050, the population living in urban areas, mainly in small and medium cities, is expected to increase to 12.2 million (92 percent of the projected population). This accelerated urbanization also results in challenges to providing quality basic services<sup>19</sup> that in turn could be highly vulnerable to climate change.
- » **The environmental unsustainability of key economic sectors such as agriculture, tourism, and water.** Agricultural production has been contributing a constant 6–7 percent to GDP over the past 10 years. The main exported products include bananas (33 percent), cocoa beans (30 percent), unmanufactured (whole-leaf) tobacco (10 percent), and tropical fruits such as avocado, coconuts, and mangoes.<sup>20</sup> However, unsustainable agricultural practices are contributing to deforestation in upper watersheds, soil erosion, and the pollution of water sources. Tourism similarly faces environmental sustainability challenges. Growing on average 4.5 percent a year over 2015–2019, tourism has become a multiplier sector in the economy. In 2021, the sector (hotels, bars, and restaurants) accounted for 25.2 percent of foreign direct investment (FDI) and 22.7 percent of foreign exchange inflows into DR, and the country is the main tourist destination in the Caribbean and the fourth most popular in Latin

<sup>15</sup> ONE (Oficina Nacional de Estadística), *Estimaciones y proyecciones de la población urbana por año calendario, según sexo y grupos quinquenales de edad, 2000-2030*. Urban population is defined by the Dominican government as the people who live in the heads of the municipalities or municipal districts; the rest of the population that does not reside in these areas are considered as the rural population.

<sup>16</sup> For the last two decades, the DR has had a higher urbanization rate than the LAC regional average, with the country following a similar urbanization trend as other Central American countries. Urban growth reached 1.9 percent growth in 2019 (compared to 1 percent for LAC). In the Caribbean, only Haiti surpasses the Dominican Republic's urban growth rates, with 2.8 percent in 2019.

<sup>17</sup> World Bank, *Second Disaster Risk Management Development Policy Loan With A Catastrophe Deferred Drawdown Option* (Washington, DC: World Bank, 2022), <https://documents1.worldbank.org/curated/en/099120011092214083/pdf/BOSIB04c431f950c90b3700d2e3791f06da.pdf>.

<sup>18</sup> ONE (Oficina Nacional de Estadística), *Estudio Metodología para la identificación de tugurios en el Distrito Nacional Censo 2010* (Santo Domingo, República Dominicana, 2016), <https://one.gob.do/publicaciones/2016/estudio-metodologia-para-la-identificacion-de-tugurios-en-el-distrito-nacional-censo-2010/?altTemplate=publicacionOnline>.

<sup>19</sup> World Bank, *Paving the way for prosperous cities and territories: Urbanization and Territorial Review of the Dominican Republic* (Washington, DC: World Bank, 2022), <https://doi.org/10.1596/37710>.

<sup>20</sup> OECD, UNCTAD, and ECLAC, *Production Transformation Policy Review of the Dominican Republic: Preserving Growth, Achieving Resilience* (Paris: OECD Publishing, 2020), <https://doi.org/10.1787/1201cfea-en>.

America. However, each tourist consumes as much as three times the water Dominicans on average consume, and the entire sector is responsible for 43 percent of commercial energy demand and 40 percent of total country waste.<sup>21</sup> Together, these are exacerbating already existing local challenges related to water efficiency, use and supply. It is estimated that 65 percent of urban households and 52 percent of rural households experience intermittent water supply.<sup>22</sup> There are significant losses in the distribution of water for consumption and irrigation (70 percent inefficiency in irrigation and more than 45 percent physical and commercial losses).<sup>23</sup> Addressing the inefficiency of water use in irrigated agriculture is critical, as this sector uses the most water (82 percent) at the national level.<sup>24</sup>

- » **Limited efficiency and sustainability of the electricity and transport sectors.** High carbon intensity in electricity generation where 71 percent of the 5,075 MW of installed capacity is from gas, coal, and fuel oil<sup>25</sup> and transportation still dominated by vehicles with internal combustion engines has significant lock-in effects. Heavy reliance on fossil fuels exposes the country to commodity price volatility, adding to budgetary pressure. High public spending on energy subsidies crowds out fiscal space for social spending to improve human capital.<sup>26</sup> The transport sector contributes significantly to both production and employment, accounting for 8.5 percent and 6.4 percent, respectively, in 2022. Overland transportation has a significant impact on economic growth since it connects the DR's economic hubs and market access. Urban centers are very congested and costs to the country are estimated around US\$300 million per year.<sup>27</sup>

**The DR's climate risks will make it difficult to achieve inclusive and equitable development.** Because of its geographical position and island status, the country is highly vulnerable to various natural shocks including droughts, floods, storms, hurricanes, landslides, and wildfires.<sup>28, 29</sup> Recurring hurricanes and tropical storms cause high human and economic losses. Annual Average Loss (AAL) of the country's building stock to hurricanes is estimated to be US\$345 million (0.48 percent of GDP).<sup>30</sup> Furthermore, 35 percent of the transport network in the DR is vulnerable to extreme weather events (for example, flooding or tropical cyclones).<sup>31,32</sup> Climate-related events, including hurricanes, have a regressive distributional effect, affecting mostly those who are poorer and who live in more vulnerable conditions.

<sup>21</sup> OECD, UNCTAD, and ECLAC, *Production Transformation Policy Review*.

<sup>22</sup> World Bank, *Dominican Republic Public Expenditure Review* (Washington, DC: World Bank, 2021), <https://documents.worldbank.org/en/publication/documents-reports/documentdetail/291631623997023891/dominican-republic-public-expenditure-review> License: CC BY 3.0 IGO.

<sup>23</sup> World Bank, *Country Partnership Framework*.

<sup>24</sup> Government of the Dominican Republic, *National Multi-Year Public Sector Plan 2021-2024* (Santo Domingo, DR, 2021), <https://mepyd.gob.do/wp-content/uploads/drive/DIGEDES/PLAN%20PLURIANUAL%20SECTOR%20PU%CC%81BLICO%202017-2020/PNPS-Plan%20Nacional%20Plurianual%20del%20Sector%20Pu%CC%81blico.pdf>.

<sup>25</sup> The country's total electricity generation in 2022 was 22,144 GWh, of which 46 percent came from natural gas, 31 percent from coal, 8 percent from fuel oil, 6 percent from hydropower, 5 percent from wind, 3 percent from solar, and 1 percent from biomass. Organismo Coordinador del Sistema Eléctrico Nacional Interconectado de la República Dominicana (OC), *Memoria Anual* (Santo Domingo, DR), <https://www.oc.do/Informes/Administrativos/Memoria-Anual?Command=Core>.

<sup>26</sup> Electricity subsidies, which account for 1 percent of GDP, are higher than the average in Latin America and the Caribbean, according to UNFCCC, *Technical Assessment of Climate Finance*. This is compounded by unreliability in the electricity service delivery, which affects particularly small firms and the poorest households.

<sup>27</sup> IDB, *Program to Support Mobility, Overland Transportation, and Road Safety in the Dominican Republic II* (Washington, DC: Inter-American Development Bank, 2022), <https://www.gtai.de/resource/blob/895522/34e8eca87d076dd5581bf09dccebc08/PRO20210407635040.pdf>.

<sup>28</sup> *ThinkHazard!* web-based tool, <https://thinkhazard.org/en/report/72-dominican-republic>.

<sup>29</sup> IFRC (International Federation of Red Cross and Red Crescent) *Analysis of legislation related to disaster risk reduction in the Dominican Republic Societies* (Geneva: IFRC, 2020), [https://www.preventionweb.net/files/24921\\_1206800idrianalysisdominicanrepubli.pdf](https://www.preventionweb.net/files/24921_1206800idrianalysisdominicanrepubli.pdf).

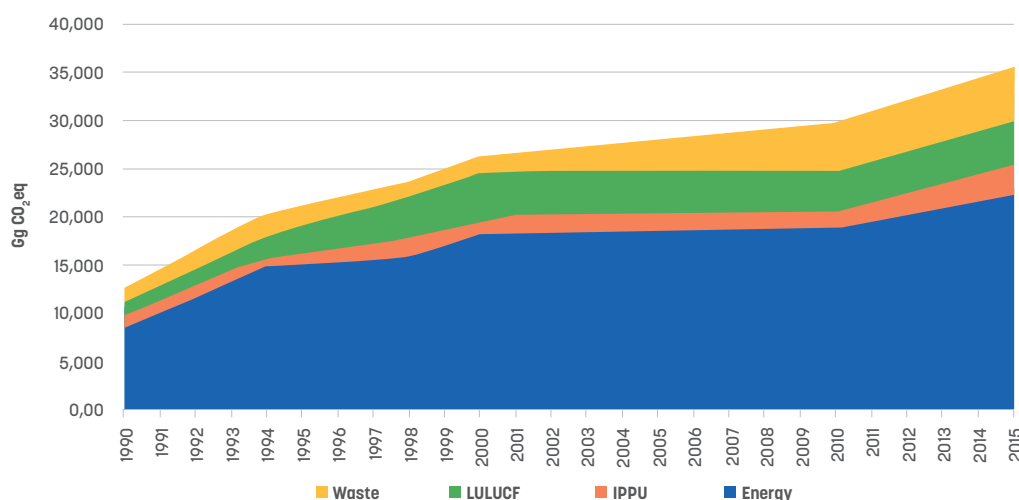
<sup>30</sup> World Bank, *Hurricanes and Earthquakes Risk Profile, Dominican Republic* (Washington, DC: World Bank, 2018), [https://www.gfdrr.org/sites/default/files/publication/Final\\_CDRP\\_DR-eng.pdf](https://www.gfdrr.org/sites/default/files/publication/Final_CDRP_DR-eng.pdf).

<sup>31</sup> World Bank, *Consolidating the Recovery: Seizing Green Growth Opportunities. Semiannual Report for Latin America and the Caribbean* (Washington, DC: World Bank, 2022), <https://elibrary.worldbank.org/doi/abs/10.1596/978-1-4648-1867-7>.

<sup>32</sup> The top five coastal municipalities with higher risks from climate change are Higüey, Yuma, Samaná, Miches, and Santo Domingo. Fundación Plenitud, DAI SPRL, and IRMA, *Análisis de riesgo ante el cambio climático de los sistemas costero-marinos de la República Dominicana*. (DR, 2022), [https://fundacionplenitud.org/wp-content/uploads/2022/09/1-Estudio-de-riesgo-ante-el-CC-de-Zonas-Costeras-marzo-2022\\_compressed\\_compressed.pdf](https://fundacionplenitud.org/wp-content/uploads/2022/09/1-Estudio-de-riesgo-ante-el-CC-de-Zonas-Costeras-marzo-2022_compressed_compressed.pdf).

**The DR's carbon footprint is relatively small, but the persistently steady rise in emissions threatens the country's GHG emission reduction goals.** In 2020, emissions were 3.27 t CO<sub>2</sub>eq/capita, significantly lower than both the world average (6.12 t CO<sub>2</sub>eq/capita) and the LAC average (5.98 t CO<sub>2</sub>eq/capita).<sup>33</sup> However, national GHG inventories have shown an increase in emissions: in 2015<sup>34</sup> emissions were 18.85 percent higher than the 2010 base year<sup>35</sup> (figure 1).

**FIGURE 1.** Historical distribution of emissions per sector (1990–2015) without LULUCF



Source: Global Factor (2022).

**The government's strategic and planning documents address both climate and development.** The National Development Strategy (NDS) 2012–2030 and the National Multi-Year Public Sector Plan (Plan Nacional Plurianual del Sector Público, NPSP) 2021–2024, call for a development path that is green, inclusive, and climate-resilient, and where public institutions can deliver high-quality services. The NDS is organized around four pillars that seek to promote a sustainable and resilient economy based on government efficiency, with equal opportunities and the sustainable management of natural resources.<sup>36</sup> The NPSP 2021–2024 seeks to foster inclusive development that relies on a modern, efficient, and effective state capable of addressing challenges related to deficiencies in public services. It includes 33 priority policies that are aligned with the NDS, the 2020 NDC, and the Sustainable Development Goals (SDGs).<sup>37</sup> The DR has outlined key adaptation measures in the National Climate Change Adaptation Plan (PNACC) 2015–2030. The PNACC includes six strategic pillars, each with specific objectives and lines of action: water and food security, climate-resilient infrastructure, health and resilient communities, resilience of forests and ecosystems, business competitiveness, and sustainable use of coastal and marine resources.

## 1.2. Risks and development opportunities from climate change and natural hazards

**Climate change is expected to increase average temperatures, decrease precipitation, and affect sea-level rise.** Since the 1960s, the average annual temperature has increased approximately 0.45 °C, with a significant increase in the number of hot days (63) and hot nights (48), which impacts economic activity

<sup>33</sup> DR's share of global emissions in 2020 (0.075 percent = 35.5 MtCO<sub>2</sub>/4751 MtCO<sub>2</sub>). Source: World Resources Institute, *Climate Watch Historical GHG Emissions* (Washington, DC: World Resources Institute, 2022), <https://www.climatewatchdata.org/ghg-emissions>.

<sup>34</sup> Ministry of Environment and Natural Resources, National Council for Climate Change and Clean Development Mechanism, and United Nations Development Program, *First Biennial Update Report Update of the Dominican Republic to the United Nations Framework Convention on Climate Change* (Santo Domingo, Dominican Republic, 2020), <https://unfccc.int/documents/227895>. Total emissions (excluding the land category) were estimated at 35,486.03 Gg CO<sub>2</sub>eq. Net emissions in the same year were estimated to be 24,634.24 Gg CO<sub>2</sub>eq.

<sup>35</sup> Note that potential causes for the increase in emissions can be attributed to differences in activity data (2010 to 2015) and improvements in methodology.

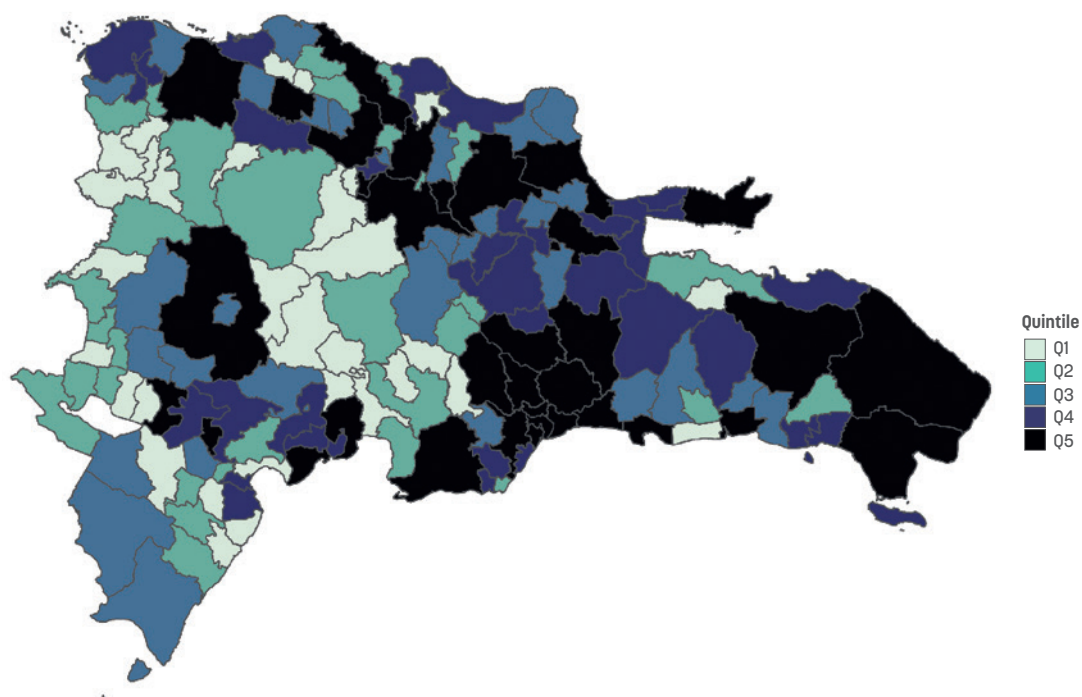
<sup>36</sup> MEPyD, *National Development Strategy 2010-2030* (Santo Domingo, DR: Ministry of Economy, Planning and Development, 2012), <https://mepyd.gob.do/mepyd/wp-content/uploads/archivos/end/documento-base-propuesta-end-2010-2030.pdf>.

<sup>37</sup> Government of the Dominican Republic, *National Multi-Year Public Sector Plan 2020-2024* (Santo Domingo, DR, 2021), <https://mepyd.gob.do/wp-content/uploads/drive/DIGEDES/PLAN%20PLURIANUAL%20SECTOR%20PU%CC%81BLICO%202017-2020/PNPSP-Plan%20Nacional%20Plurianual%20del%20Sector%20Pu%CC%81blico.pdf>.

negatively. Notably, rising temperatures between 2015 and 2020 were associated with productivity losses of 2–9 percent among manufacturing firms located in poor regions of the country.<sup>38</sup> By midcentury, the country's average annual temperature is projected to rise from 24.5 °C to 25.9 °C under a high emissions scenario (SSP5–8.5, where SSP is the shared socioeconomic pathway). By the end of the century, average temperatures are expected to increase by 2.5 to 5 °C under a high emissions scenario, with the number of days per month that surpass 35 °C (primarily between May and October) increasing sharply from the 2080s onward. The DR has already experienced a slight reduction in total precipitation and by midcentury is likely to experience a further decrease, and an increase in the number of consecutive dry days, primarily from May to August.<sup>39</sup> Higher-intensity windspeed and storm surge are also expected due to climate change. The Caribbean Sea experienced an average change in sea level of 1.7 mm/y (+/- 1.3) over the 1993–2010<sup>40</sup> period. By 2050, coastal areas of the DR are likely to experience an average sea-level rise of +0.5 meters (RCP 8.5) and by 2069 an average of 0.6 m (RCP 8.5).<sup>41</sup> Sea-level rise is expected to increase coastal erosion, affect ecosystems, displace populations, and produce water pollution and water supply interruptions.

**As a result, climate risk is determined to be very high in almost all municipalities.** The Ministry of Economy, Planning and Development (MEPyD) recently developed a climate risk index<sup>42</sup> based on IPCC methodology (2014) that includes information on vulnerability, the levels of climate hazard, and exposure to such hazards at the municipal level. According to this index, for agriculture, tourism, human settlements, and livelihood sectors, 10 municipalities exhibit very high levels of exposure vulnerability and hazard (figure 2): Santo Domingo East, Santo Domingo North, Distrito Nacional, Santo Domingo Oeste, Santiago, Higüey, Los Alcarrizos, La Vega, San Cristóbal and Moca. If the tourism sector is excluded, the 10 municipalities at highest risk are Higüey, Santo Domingo Norte, Santo Domingo Este, Distrito Nacional, Santiago, Santo Domingo Oeste, La Vega, Yamasá and Moca y Los Alcarrizos.

**FIGURE 2.** Climate risk index



Source: Government of the Dominican Republic, Ministry of Economy, Planning and Development (forthcoming).

<sup>38</sup> World Bank, *Dominican Republic Country Economic Memorandum*.

<sup>39</sup> World Bank, *Climate Change Knowledge Portal* (Washington, DC: World Bank, last accessed Monday November 6, 2023), <https://climateknowledgeportal.worldbank.org>.

<sup>40</sup> WHO, PAHO, and UNFCCC, *Health & Climate Change: Country Profile 2021—Small Island Developing States Initiative* (World Health Organization, Pan American Health Organization, and United Nations Convention on Climate Change, 2021), <https://www.preventionweb.net/quick/71475>.

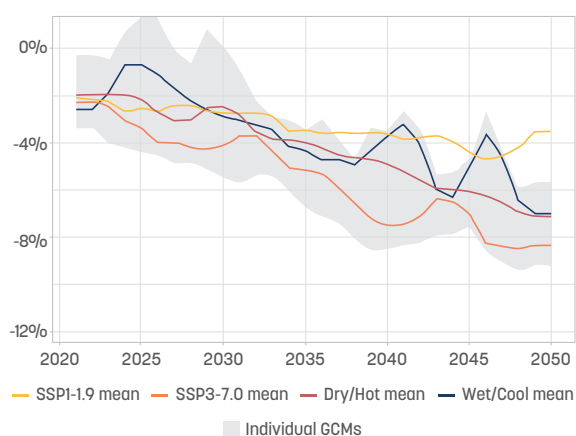
<sup>41</sup> Fundación Plenitud, DAI SPRL, and IRMA, *Análisis de riesgo ante al cambio climático*.

<sup>42</sup> Government of the Dominican Republic, *Índices de vulnerabilidad y riesgo ante la variabilidad y el cambio climático a nivel de los municipios de la República Dominicana* (Santo Domingo, DR, forthcoming).

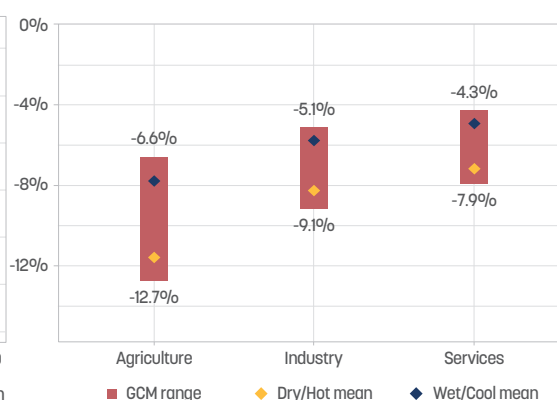
**Climate change threatens the DR's development gains.**<sup>43</sup> Key impacts channels include:

- » **Water supply.** Unmet demand for water in irrigation, municipal, and industrial sectors is already affecting the Dominican Republic and is likely to increase with climate change (annex 2). Total unmet demand is expected to more than double under a Dry/Hot scenario,<sup>44</sup> increasing from 15 million m<sup>3</sup> under current conditions to 35 million m<sup>3</sup>. The Warm/Wet scenario results in a 40 percent increase to 21 million m<sup>3</sup>. This unmet demand is concentrated in the agricultural sector. By mid-century unmet irrigation demand is likely to increase substantially, with a smaller expected increase in municipal and industrial water demand. The Dry/Hot mean scenario is expected to result in a +6–16 percent increase in unmet irrigation demand, relative to the baseline. The Wet/Warm mean scenario is expected to lead to a smaller increase in unmet demand ranging from +3 percent to +11 percent, by 2050. Unmet demand in the municipal and industrial water sectors rises less, from 4 percent of total demand to 6.9 and 1.1 percent on average in a Dry/Hot and Warm/Wet scenario respectively.
- » **Labor supply and productivity.** Heat stress is expected to affect the agriculture, industry and services sectors by increasing workday temperatures and decreasing the number of hours an individual can perform work. The overall labor productivity for the three sectors is expected to decrease over time, resulting in a labor supply shock ranging from around -3.5 percent to -9 percent by 2050 (figure 3). In the 2041–2050 period, labor supply shocks are expected to be highest for agriculture, followed by industry, and then services (figure 4).

**FIGURE 3.** Labor productivity, 3-year moving average



**FIGURE 4.** Labor productivity shock 2041–2050



Source: Simulations prepared by Industrial Economics for this report (further details in annex 2).

- » **Damage to infrastructure.**<sup>45</sup> The frequency and severity of capital damages is expected to increase because of changes in inland flooding. For the 2035–2064 period, changes in the magnitude of flooding events from climate change are highest in catchments in the center of the country, specifically in the areas surrounding San Juan, Santiago and La Vega (figure 5). Impacts are expected to be higher from more frequent events such as 20- and 25-year floods, with shocks increasing up to 27 percent in the center of the country. Climate change is expected to exacerbate the impact of tropical cyclones and

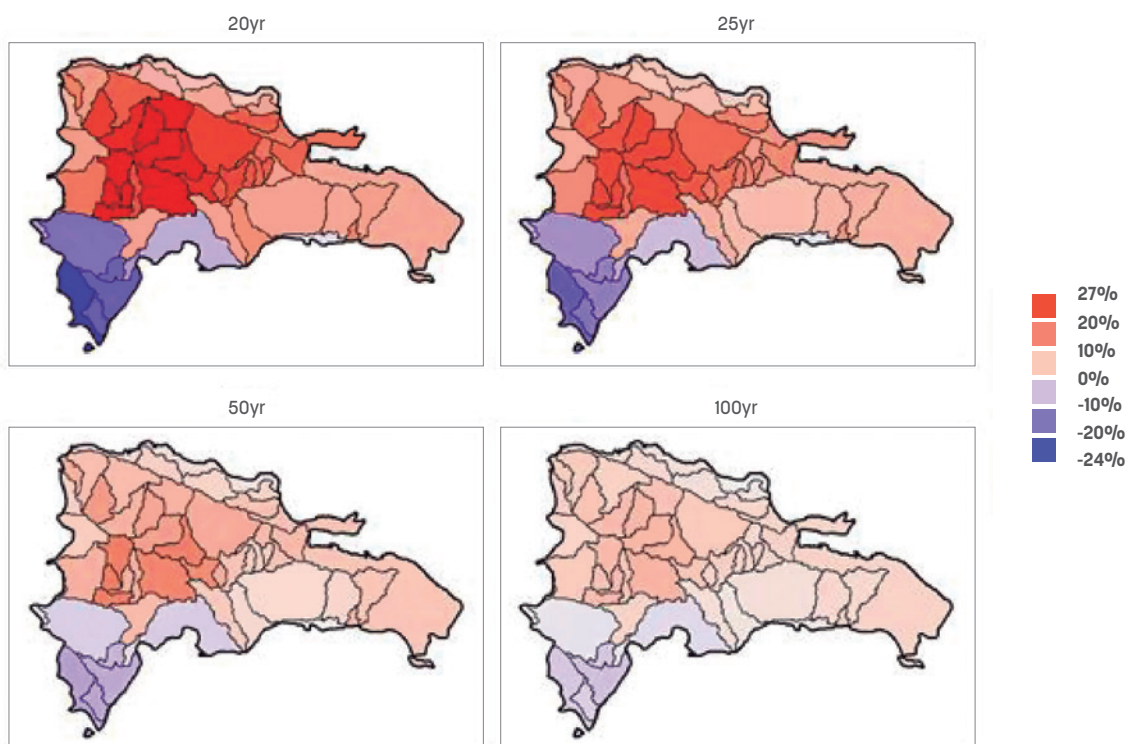
<sup>43</sup> Shocks from each channel were calculated specifically for this report based on changes in climate variables for the 30-year period from 2021 to 2050, relative to a climate baseline from 1995 to 2020.

<sup>44</sup> For this study, a subset of scenarios that represent an appropriate range of possible future climate conditions was used. In particular, we considered two sets of climate futures: one to assess the impact of uncertain global mitigation efforts and one to assess local climate risks and overall model uncertainty. The first set of scenarios (that is, scenarios selected to allow for comparisons across emissions trajectories, referred as mitigation scenarios) were selected in accordance with World Bank guidelines, which recommends selecting an optimistic and a pessimistic scenario of GHG concentrations that are driven by global GHG emissions trajectories and mitigation policies. For these, the SSP3–7.0 ensemble mean as a pessimistic case and the SSP1–1.9 ensemble mean as an optimistic case were used. SSP1–1.9 represents reductions in GHG emissions in line with 1.5 °C warming by 2100. SSP3–7.0 is a scenario in which warming reaches 4 °C by 2100. For the second set of scenarios (that is, scenarios selected to assess overall model uncertainty), a subset of extreme GCM runs that represent a "dry and hot" and a "wet and warm" future for the country under analysis, for the study period between 2020 and 2050 was selected. Additional details can be found in annex 2.

<sup>45</sup> The analysis considered the built environment, including buildings, roads/bridges and equipment.

hurricanes. Through 2090, the occurrence of all categories of cyclones (1 to 5) is likely to increase under the SSP2-4.5 and SSP3-7.0 scenarios, increasing annual damage. Under SSP3-7.0, capital shocks are approximately -3.5 percent and -2.2 percent in the 2030s and 2050s, respectively. Figure 5 presents a map of expected annual damage as a percentage of asset value under SSP3-7.0 for the period 2041 to 2060. Overall, damage is highest along the southwest and southeast coast, peaking at around -5 percent. Rising mean sea levels and temporary flooding from storm surge events threaten coastal infrastructure and land. By 2050, impacts from sea-level rise may result in a -0.5 percent shock to capital, while impacts from storm surge result in an approximately -0.03 percent shock to capital.

**FIGURE 5.** Change in capital losses from inland flooding (percent change relative to baseline), SSP3-7.0, 2035-2064



Source: Simulations prepared by Industrial Economics for this report (further details in annex 2).

- » **Tourism demand.** Climate change may affect tourism through disruptions caused by the increased frequency and magnitude of extreme events. Relative to baseline conditions, climate change is expected to reduce tourism revenues from 7 to 16 percent by mid-century. In addition, Caribbean countries and specifically the DR have been increasingly affected by sargassum.<sup>46</sup> In 2022 alone, 2.8 million tons of sargassum reached the DR.<sup>47</sup> The links between sargassum and tourism demand have not been reflected in the model because of the lack of country-specific quantitative data. Yet, there is strong and increasing evidence that coastal sargassum greatly affects tourism revenue<sup>48</sup>, while also negatively affecting coastal economies, beaches, and marine biodiversity. Emerging evidence also suggests potentially negative effects of sargassum in the form of heavy metal accumulation and deposition death of marine animals, and release of toxic gases.<sup>49</sup> Discussion about appropriate

<sup>46</sup> Sargassum is a genus of large brown seaweed (a type of algae) that floats in island-like masses and never attaches to the seafloor. NOAA Ocean Exploration (National Oceanic and Atmospheric Administration), *What is Sargassum?* (Washington DC: U.S. Department of Commerce), <https://oceanexplorer.noaa.gov/facts/sargassum.html>.

<sup>47</sup> Estimate from National Statistical Office (ONE). M. de Jesús, *Bávaro-Punta Cana, zona de RD con mayor reporte de sargazos en 2023* (DR: El Dinero Noticias, 2023), <https://eldinero.com.do/231600/bavaro-punta-cana-zona-de-rd-con-mayor-reporte-de-sargazos-en-2023/>.

<sup>48</sup> An example of such evidence can be found in V. Chávez, A. Uribe-Martínez, E. Cuevas, R. E. Rodríguez-Martínez, B. I. van Tussenbroek, V. Francisco, M. Estévez, et al., "Massive Influx of Pelagic Sargassum spp. on the Coasts of the Mexican Caribbean 2014-2020: Challenges and Opportunities," *Water* 12, no. 10 (September 2020), <https://doi.org/10.3390/w12102908>.

<sup>49</sup> For a broad overview of existing evidence and studies: United Nations Environment Programme- Caribbean Environment Programme, *Sargassum White Paper. - Turning the crisis into an opportunity*. Ninth Meeting of the Scientific and Technical Advisory Committee. (STAC) to the Protocol Concerning Specially Protected Areas and Wildlife (SPA/W) in the Wider Caribbean Region (Kingston, Jamaica, 2021).

measures to address sargassum focuses on mitigation at source, removal, and potential for using sargassum as an input for productive value chains, though there remains a lack of consensus about best practices to manage the phenomenon or the scale and feasibility of potential opportunities.

- » **Crop yields.** Most of DR's crop production area is used for rice (17 percent), cocoa (15 percent) and sugarcane (11 percent). The share of revenue by crop is roughly split between tropical fruits, avocados, vegetables, bananas, and plantains, with these five crops accounting for about 70 percent of revenue.<sup>50</sup> By 2050, climate change is anticipated to have both positive and negative production shocks on a majority of rainfed and irrigated crops. Production shocks for rainfed crops include a +2 percent and -26 percent shock to sugarcane under the Wet/Warm mean and Dry/Hot mean, respectively, while high-value crops such as avocados and bananas are expected to experience a zero percent shock under the Wet/Warm mean, and a -25 and -28 percent shock from the Dry/Hot mean, respectively. For irrigated crops, production shocks to rice range from +3 to -18 percent across the different scenarios, while citrus, tobacco, potatoes, and vegetables are expected to experience only negative production shocks. Overall, it is estimated that the impact of climate change on rainfed crops by 2050 under the Wet/Warm and Dry/Hot mean scenarios, as compared to the baseline, will result in a -1 percent and -20 percent shock, respectively. For irrigated crops, by 2050, the Wet/Warm and Dry/Hot mean scenarios are expected to result in a -3 percent and -13 percent shock, respectively.

### Box 1.1 Climate Induced Migration

**Climate change impacts, compounded by natural resource degradation and limited access to basic services, are expected to affect migration patterns and vulnerable populations.** In the DR, there are significant flows of both internal migrants, mainly rural-to-urban, and international cross-border migrants, especially Haitians, who represent 4.9 percent of the population. Projections show that internal climate migration in the DR is expected to be strongly oriented around rural-to-urban migration, and in some cases, substantial urban-to-urban migration.

**The combination of reduced agricultural output, reduced capacity for pastoralism, and water stress (particularly in irrigated croplands) is expected to drive people from rural to urban areas.** Estimates show that by 2050 the center of Santo Domingo (National District) will become a net receiving point of internal climate migrants from different parts of the country. However, toward the end of the century, National District might become a net climate out-migration site as increased population density — combined with water stress— push people to move to the suburban strip of Santo Domingo.

**The likely pattern is one of internal emigration out of agricultural and pastoral regions by the Dominican population, fueling urban growth, with the same regions experiencing an influx of, presumably, circular and labor migrants from Haiti, much of which could be driven by climate change impacts in Haiti.** It is worth noting that patterns of internal climate migration tend to follow changes in environmental conditions within the DR. On the other hand, estimates indicate that the number of migrants from Haiti, while responding slightly to conditions in the DR, seem to be more driven by existing social networks and the potential for rural labor opportunities.

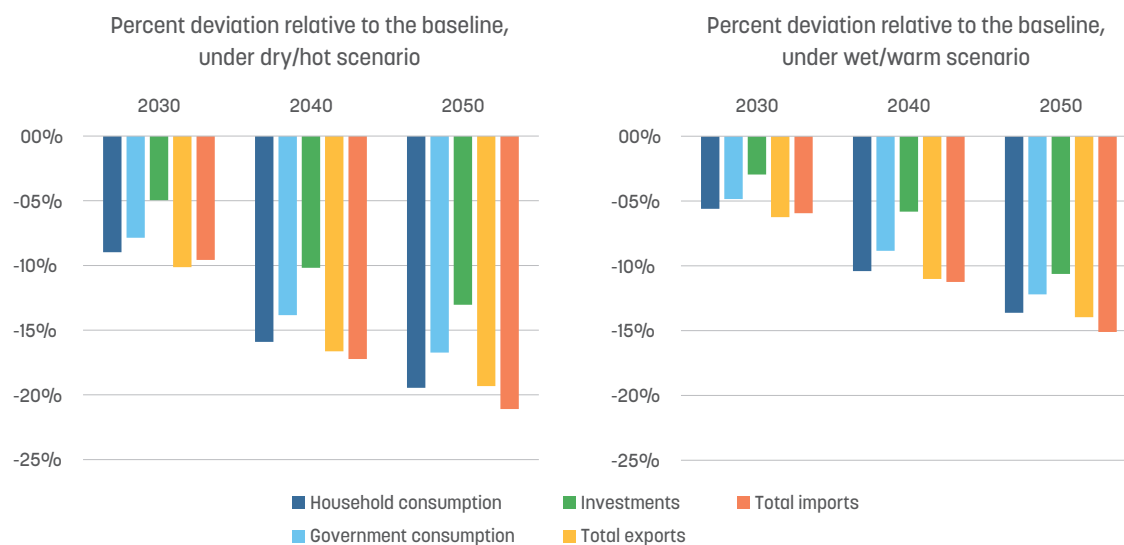
Source: World Bank, Dominican Republic Climate Migrants Country Note. (Washington, DC: World Bank, forthcoming).

<sup>50</sup> See annex 2 for details, data based on FAO Food and agriculture data. FAOSTAT, *Crops and Livestock Products* (FAO, 2021); FAOSTAT, *Value of Agricultural Production* (FAO, 2021), <https://www.fao.org/faostat/en/#home>.

» **Natural resources and ecosystem services.** Coastal and marine ecosystems are expected to be significantly affected by climate change, including through coastal flooding, sea-level rise, erosion, coral bleaching, and loss of mangroves.<sup>51</sup> In 2019, an assessment of coastal ecosystem services in the DR estimated their value at around US\$689.56 million, or 0.9 percent of the country's GDP. The highest coastal ecosystem service value was estimated for tourism, followed by fisheries and carbon sequestration.<sup>52</sup> Deforestation is one of the main environmental problems in the DR and deforested areas are more susceptible to desertification and drought.<sup>53</sup> Cloud forests, home to many endemic species, have been reduced as a result of land use change and fires, and may disappear completely due to increased temperatures and reduced moisture levels related to climate change.<sup>54</sup> These impacts will affect vulnerable populations that depend on coastal and forest ecosystems for their livelihoods. In addition, erosion risk is likely to increase by 2040 under a Wet/Warm scenario, with major implications for crop production within the country.<sup>55</sup>

**Climate shocks, it is estimated, will have a significant impact on economic activity.** Natural hazards have historically affected economic activity in the DR. Between 1960 and 2017, direct and indirect costs associated with disasters were estimated to be US\$8.61 billion (2015 dollars).<sup>56</sup> The occurrence and impact of these events have increased, with tropical storms being the most frequent. In addition, the country is increasingly vulnerable to slow-onset changes, mainly from rising temperatures and sea levels. Climate-induced GDP deviations from the baseline scenario could reach up to 16.7 percent of GDP by 2050 (figure 6), according to the Mitigation, Adaptation and New Technologies Applied General Equilibrium (MANAGE) model (box 1.2 and appendix 1), calibrated for the DR.<sup>57</sup> Of this, more than 80 percent of the decline can be attributed to three channels: reduced labor productivity caused by heat stress, increased tropical storms, and lower tourism demand.

**FIGURE 6.** Climate change impact in GDP: Demand side



Source: World Bank staff estimates using MANAGE (2023).

<sup>51</sup> Fundación Plenitud, DAI SPRL, and IRMA, *Análisis de riesgo ante al cambio climático*.

<sup>52</sup> The Nature Conservancy, *Valuing Benefits of Mangroves and Coral Reefs in the Caribbean* (2019), [https://media.coastalresilience.org/Resilient\\_Islands/BenefitsOfMangrovesAndCorals\\_TechReport.pdf](https://media.coastalresilience.org/Resilient_Islands/BenefitsOfMangrovesAndCorals_TechReport.pdf).

<sup>53</sup> Government of the DR, *Third National Communication* (DR, 2018), <https://unfccc.int/documents/39777>.

<sup>54</sup> J. D. Lloyd, and Y. M. Leon, *Forest Change within and outside Protected Areas in the Dominican Republic, 2000-2016* (2019), <https://doi.org/10.1101/558346>.

<sup>55</sup> See annex 2 for more information.

<sup>56</sup> Government of the DR, *Dominican Republic Fiscal Risk Report 2023 (Informe de Riesgos Fiscales 2022)*. (Santo Domingo, DR: Ministry of Finance, 2022), <https://www.digepres.gob.do/wp-content/uploads/2023/03/8.-Informes-de-Riesgos-Fiscales.pdf>.

<sup>57</sup> The baseline scenario (BAU) is a projection until 2050 without any climate change damage. The model compares the GDP impact in any given year to what the GDP would have been without the climate change impact.



## Box 1.2. Summary of the Modeling Approach

**Model: The Dominican Republic CCDR employs a version of the MANAGE model.** It is a single-country recursive dynamic computable general equilibrium (CGE) model designed to focus on energy, emissions, and climate change, and that explicitly models the year-by-year effects of a particular policy or shock on the economy. In addition to the standard features of a single-country CGE model, the MANAGE model includes a detailed energy specification that allows for capital/ labor/energy substitution in production, intra-fuel energy substitution across all demand agents, and a multi-output, multi-input production structure. The specificities of the model are described in detail in Van der Mensbrughe (2017)<sup>58</sup> and the macroeconomic appendix (no. 1).

**Impact Channels: The MANAGE model for the DR was initially extended to assess the potential gains of productivity policies in the context of the Country Economic Memorandum (forthcoming World Bank publication).** This CCDR further extends the model to incorporate the path of emissions from key sectors (transport, energy, AFOLU), and to incorporate DR-specific climate damage functions to introduce the impact of climate change on the economy. These damage functions are estimated by a bio-physical model tailored to DR and cover the channels described below.

**By 2050, climate change is expected to increase poverty by 0.5 to 0.8 percentage points across the two climate scenarios.** In the baseline scenario, the percentage of people living in poverty (measured by the national poverty line) is expected to decrease from 27.7 to 4 percent between 2022 and 2050. Economic growth, spurred by increased productivity and technological change, is expected to increase labor income and reduce poverty. As an upper middle-income country, profound changes to the economic structure of the DR have already occurred, but further structural change, where workers move from low to high-productivity sectors, may also contribute to poverty reduction. The projected decline of 23.7 percentage points in the poverty headcount ratio can be explained in particular by increases in wages (14.1 percentage points) and non-labor income (10.3 percentage points), with a negligible increase of poverty (0.7 percentage points) explained by a higher dependency ratio. However, in the absence of adaptation or mitigation measures, climate change has the potential to undermine these positive developments. By 2050, poverty will be 0.5 and 0.8 percentage points higher than the baseline scenario, as per estimates from the wet/warm and dry/hot scenarios, respectively. These changes would represent nearly 70,000 to 110,000 people falling into or remaining in poverty because of climate change.

**By 2050, among households where the main earner works informally, climate change will increase the poverty headcount by 0.6 to 1.2 percentage points relative to the baseline scenario.** This is partially because of the higher concentration of informal jobs in hospitality, agriculture, retail commerce, and domestic services, which are more prone to be affected by heat stress. Additionally, informal workers already face greater challenges in coping with the consequences of climate change as they tend to be poorer and thus possess limited and undiversified assets. By contrast, in households where the main earner is formally employed, poverty would be expected to increase between 0.3 to 0.4 percentage points relative to the baseline scenario.

**Households in the agricultural sector are more likely to be affected by climate change in the pessimistic climate scenario, while in the optimistic scenario, there are no differences across sectors.** By 2050, in the combined dry/hot scenario, climate change will increase the poverty headcount by 1.5 percentage points in the

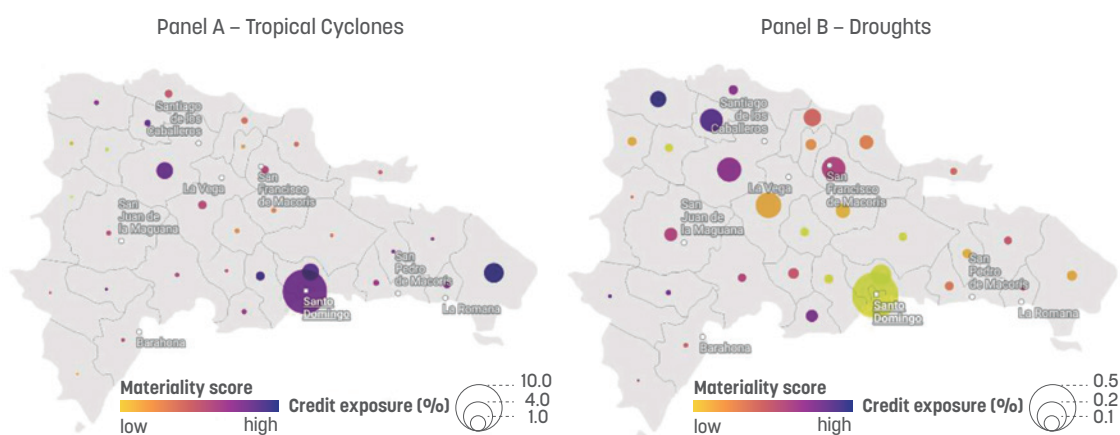
<sup>58</sup> D. Van der Mensbrughe. *The Mitigation, Adaption and New Technologies Applied General Equilibrium (MANAGE) Model, Version 2.0g*. (Indiana: Center for Global Trade Analysis, Purdue University, 2020); and D. Van der Mensbrughe, *The Mitigation, Adaption and New Technologies Applied General Equilibrium (MANAGE) Model, Version 2.0f*. (Indiana: Center for Global Trade Analysis, Purdue University, 2017), <https://mygeohub.org/groups/gtap/manage-docs>.

households where the main earner works in agriculture, while for services and manufacturing, it will increase by 0.7 and 0.4 percentage points, respectively. In this scenario, weather events that disrupt the patterns of crop and livestock production are more likely. On the other hand, for the combined wet/warm scenario, poverty will increase between 0.4 to 0.6 percentage points across the three employment sectors.

**The fiscal accounts will also be affected with a likely decline in government revenues.** Relative to the business as usual scenario, losses are expected to be up to 19.7 percent of total general government revenues, and include corporate income taxes, property taxes, dividends from mining companies, general tax base reduction, and other sources of revenues.<sup>59</sup> Specifically, estimates from the MANAGE model find that the losses in tax revenues could range from 0.2 to 0.9 percent of GDP, with revenue losses from tourism are expected to be significant through direct and indirect linkages.<sup>60</sup> Revisiting tax exemptions, which are around 4–5 percent of GDP, could help mitigate the potential loss of government revenue caused by climate change.

**Climate change also poses risks to the financial system through high credit exposure of the banking sector to tropical cyclones (TCs) and minor exposure of non-financial corporates to droughts.**<sup>61</sup> In the Dominican Republic, credit exposure-at-risk for TCs is concentrated in high-risk provinces, with Federal District having the highest exposure.<sup>62</sup> Figure 7 presents the results visually, where the size of the bubbles represents the credit exposure to affected sectors, and the color codes indicate the rankings of physical damage across provinces. Most exposed provinces in the country are those with high population concentration and more trade-oriented activities. Additionally, bank lending to households is exposed to physical risks from TCs. Distrito Nacional also has the highest exposure to mortgages, at 43.6 percent. The impact of climate change on housing directly affects collateral value and asset quality and increases the volume of non-performing loans. Mortgage credit represents 18.1 percent of overall credit in the country, with a significant portion allocated to provinces with high expected physical damage.

**FIGURE 7.** Non-financial corporates credit-exposure-at-risk to natural hazards



Source: BCRD data and World Bank estimations.

Note: Materiality scores represent a combined measure of disaster risk (combining hazard, vulnerability, and exposure metrics) based on historical data. In the case of TC, this is the highest score from landslide, strong winds, and river and coastal flooding. Credit exposure measures the proportion of lending in each province to vulnerable sectors specific to each peril as a proportion of the total loan book.

<sup>59</sup> Revenues are expected to be larger than in 2023, but climate change is expected to reduce them relative to a scenario without climate change.

<sup>60</sup> Banco Popular Dominicano and ASONAHORES, *Turismo dominicano una década de aportes: 2009 – 2019*. (2021), [https://popularenlinea.com/empresarial/PublishingImages/TURISMO/Turismo\\_Dominicano\\_-\\_Una\\_d%C3%A9cada\\_de\\_aportes\\_2009\\_-\\_2019.pdf](https://popularenlinea.com/empresarial/PublishingImages/TURISMO/Turismo_Dominicano_-_Una_d%C3%A9cada_de_aportes_2009_-_2019.pdf).

<sup>61</sup> 100 percent of mortgage credit is classified in the affected sector "Purchase and Remodeling of Homes." This is consistent with recent empirical studies (for example, M. S. Pagliari, *LSIs' exposures to climate change related risks: an approach to assess physical risks* (2021), [https://papers.ssrn.com/sol3/papers.cfm?abstract\\_id=3797137](https://papers.ssrn.com/sol3/papers.cfm?abstract_id=3797137); and Bank of England, *Transition in Thinking: The Impact of Climate Change on the UK Banking Sector*. (London: Bank of England, 2018), <https://www.bankofengland.co.uk/-/media/boe/files/prudential-regulation/report/transition-in-thinking-the-impact-of-climate-change-on-the-uk-banking-sector.pdf>).

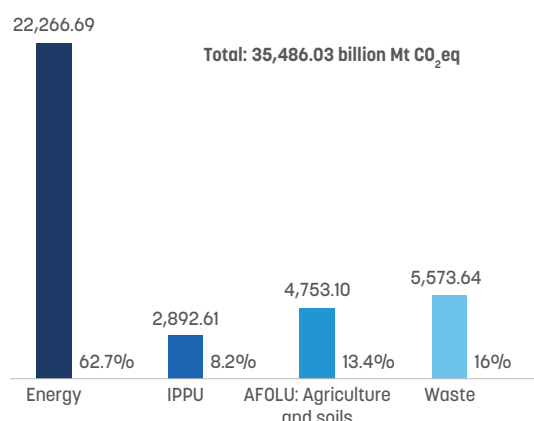
<sup>62</sup> See appendix 1 for a deeper discussion and more details on methodology.

**Provinces with substantial mortgage exposure and high TC risk are densely populated areas, facing potential increases in risk because of further urbanization and financial sector growth.** This concentration of financial activities in risk-prone provinces emphasizes the disproportionate impact. Under SSP370, damage from strong winds in TCs is projected to triple from 2021 to 2040, increasing the country's disaster risk. Approximately 20.9 percent of total credit-at-risk to TCs is exposed to strong winds. Expected annual damage, based on wind tracks data, is estimated to rise from 1 percent to 3.65 percent for the 2021–2040 period and 3.2 percent for the 2041–2060 period. La Altagracia has the highest forecast Expected Annual Impact (0.41 percent) and a 2.85 percent credit exposure to TCs. Additionally, 18.3 percent of credit exposures to strong winds (or 20.2 percent of credit exposures to TCs) are mostly concentrated in four provinces located in the southeast region: Distrito Nacional, La Altagracia, Santo Domingo, and Santiago.

### 1.3. Risks and opportunities for a low-carbon growth path

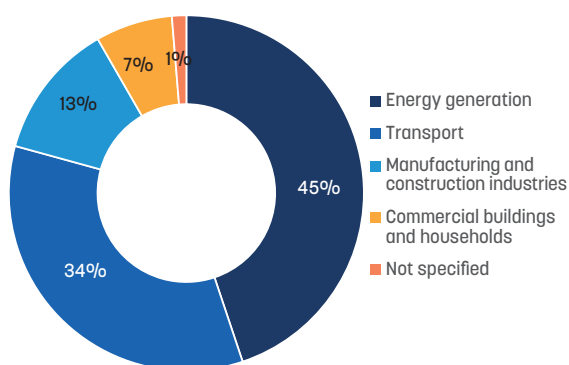
**High reliance on imported fossil fuels for power generation results in high emission intensity and poses a threat to the achievement of the GHG emission reduction goals.** The energy sector generates the greatest amount of GHG emissions in the country: 63 percent or 22,216 billion Mt CO<sub>2</sub>eq (figure 8).<sup>63</sup> Emissions from the sector increased 18 percent from 2010 to 2015 and are dominated by fuel consumption for energy generation (45 percent)<sup>64</sup> (figure 9). In 2021, fossil fuels accounted for 83 percent of total generation, while renewable energy sources accounted for 17 percent.<sup>65</sup>

**FIGURE 8.** Gross emissions in the DR are dominated by the energy sector



Source: Government of DR (2020).

**FIGURE 9.** Energy generation accounts for the largest share of GHG emissions in the energy sector



Source: Government of DR (2020).

**Transport sector emissions are rapidly growing because of increased motorization rates, especially of private vehicles, causing congestion, pollution, and traffic accidents.** The transport sector is the second-largest contributor to the country's GHG energy emissions, accounting for 34 percent or 7,635 billion Mt CO<sub>2</sub>eq in 2015, with a heavy reliance on fossil fuels. The largest share of GHG emissions (54 percent of the total) come from passenger transport, particularly private cars and motorcycles.

<sup>63</sup> Ministry of Environment and Natural Resources, National Council for Climate Change and Clean Development Mechanism, and United Nations Development Program, *First Biennial Update Report Update of the Dominican Republic to the United Nations Framework Convention on Climate Change* (Santo Domingo, Dominican Republic, 2020), <https://unfccc.int/documents/227895>. ]

<sup>64</sup> Ministry of Environment and Natural Resources, National Council for Climate Change and Clean Development Mechanism, and United Nations Development Program, *First Biennial Update Report Update of the Dominican Republic*.

<sup>65</sup> Government of the DR, *Annual Report on Renewable Energy Generation for the Sistema Eléctrico Nacional Interconectado* (Santo Domingo, DR: Viceministerio de Energía, 2021), <https://transicionenergetica.do/2022/03/21/reporte-anual-de-la-generacion-de-energias-renovables-en-el-seni-2021/>.

**Improper waste disposal in the DR causes significant pollution and health issues, besides generating GHG emissions.** The DR currently has around 240 landfills in operation<sup>66</sup>. The final disposal of waste has traditionally taken place in the open air, without meeting sanitary or environmental standards. Improper waste disposal has caused land degradation, pollution of water sources, and clogged drainage, exacerbated flooding, and generated GHG emissions. Emissions from waste represented 5,573 billion Mt CO<sub>2</sub>eq in 2015 (16 percent of emissions), a 7.7 percent increase from 2010, primarily driven by solid waste disposal (68.63 percent)<sup>67</sup> and wastewater treatment and disposal (31 percent). Waste contributes 55 percent of all methane emissions (methane represents just over a quarter of all emissions (10,301 billion Mt CO<sub>2</sub>eq in 2015), with other key livestock (37 percent) and rice cultivation (5 percent)).<sup>68</sup>

**Agriculture is the next-highest source of emissions after energy and waste, but its emissions are compensated for by a net carbon sink created by the land use sector.** In 2015, emissions from agriculture accounted for 13 percent of total emissions, increasing by 2.14 percent since 2010. The majority of GHG emissions from the agriculture sector are generated by enteric fermentation from livestock (74.5 percent) followed by rice cultivation (11 percent). The land use sector consistently absorbs CO<sub>2</sub>, representing -44.05 percent of total net emissions and accounting for 10,852 billion Mt CO<sub>2</sub>eq of carbon removal in 2015. However, compared to 2010, carbon removals decreased by 14 percent.<sup>69</sup>

**Without specific measures, emissions could double between 2015 and 2050.** The government estimates that emissions in 2030 could reach 51,000 billion Mt CO<sub>2</sub>eq in a BAU scenario.<sup>70</sup> Preliminary analyses show that maintaining the trend recorded in the last GHG inventory period (2010–2015) could lead to total emissions of 71,685.31 billion Mt CO<sub>2</sub>eq in 2050, around 41 percent more than in 2030 and 102 percent more than in 2015.<sup>71</sup> The contribution of each sector to emissions in 2030 and 2050 follows the share in 2015, with the energy sector the main source of emissions, followed by waste, AFOLU and Industrial Processes and Product Use (IPPU).

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<sup>66</sup> = Government of the Dominican Republic and JICA, *Draft National Plan for Final Disposal Site. Project for Institutional Capacity Development on Nation-wide Solid Waste Management in the Dominican Republic Phase 2* (Santo Domingo, DR, 2022), <https://openjicareport.jica.go.jp/pdf/12337747.pdf>.

<sup>67</sup> World Bank, *Dominican Republic: Poverty and Equity Brief* (Washington, DC: World Bank, 2020).

<sup>68</sup> Ministry of Environment and Natural Resources, National Council for Climate Change and Clean Development Mechanism, and United Nations Development Program, *First Biennial Update Report Update of the Dominican Republic to the United Nations Framework Convention on Climate Change* (Santo Domingo, Dominican Republic, 2020), <https://unfccc.int/documents/227895>.

<sup>69</sup> World Bank, *Dominican Republic: Poverty and Equity Brief* (Washington, DC: World Bank, 2020). <https://www.worldbank.org/en/topic/poverty/publication/poverty-and-equity-briefs>.

<sup>70</sup> Consejo Nacional para el Cambio Climático y Mecanismo de Desarrollo Limpio (CNCCMDL), *Plan Económico Compatible con el Cambio Climático (Plan DECCC), 2011-2030* (Santo Domingo, DR, 2011), [https://www.cac.int/sites/default/files/Plan\\_para\\_el\\_desarrollo\\_econ%C3%B3mico\\_compatible\\_con\\_el\\_CC\\_0.pdf](https://www.cac.int/sites/default/files/Plan_para_el_desarrollo_econ%C3%B3mico_compatible_con_el_CC_0.pdf).

<sup>71</sup> World Bank internal study based on Factor Global analytical work, *Decarbonization pathways for the Dominican Republic: Assessment and implementation of the NDC. First Report* (2022), <https://pubdocs.worldbank.org/en/840791612891209588/NDC-SF-Project-Summary-Dominican-Republic-T3.pdf>.

## 2. Country Climate Commitments, Policies, Institutions and Capacities

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### Main Messages

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- Adaptation to climate change is a priority for the Dominican Republic because of the country's high vulnerability, and the updated NDC committed to 37 adaptation measures, along with climate empowerment and institutional strengthening targets.
  - The country has several policies to foster climate change adaptation and disaster risk management, including enhancing information and strengthening infrastructure.
  - The DR's updated NDC committed to a 27 percent reduction in GHG emissions by 2030 (compared to BAU), establishing sectoral targets and 46 mitigation measures.
  - Although the DR has established some core climate governance institutions, inter-institutional coordination remains a challenge. Inconsistencies, gaps and overlaps in the strategy, policy and institutional architecture could be addressed by a climate change framework law. This law could enhance the coherence of an economy-wide approach to climate change and foster institutional efficiencies.
  - The government is working to address the lack of a 2050 long-term, low-carbon, and resilient development strategy and the absence of disaggregated climate risk information.
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### 2.1. 2030 sectoral commitments with a long-term vision

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**The updated NDC contains adaptation, climate empowerment, and institutional strengthening commitments.** The NDC includes 37 adaptation commitments in water and food security, health, infrastructure and human settlements, ecosystems and biodiversity, marine-coastal zones, and tourism.<sup>72</sup> Investment needs for adaptation are estimated at roughly US\$8.7 billion, mostly for measures related to food security, resilient cities and health.<sup>73</sup> The country is committed to advancing action for climate empowerment and the NDC contains 23 targets in areas such as capacity building, access to information and public participation. The NDC also contains ambitious institutional strengthening targets, such as the creation of an independent expert advice body.

**The updated NDC establishes 2030 sectoral emission reduction targets and states the country's aspiration to be carbon-neutral by 2050.** The NDC commits to reducing GHG emissions by 27 percent by 2030 compared to a BAU scenario. Twenty percentage points of the emissions reduction commitment is conditional on external financing; 7 percentage point is unconditional (breaking down into 5 percent points from private, and 2 percent points from public, sources).<sup>74</sup> The total emissions reduction is 13,853.71 billion Mt CO<sub>2</sub>eq, relative to a BAU scenario of 51,000 billion Mt CO<sub>2</sub>eq in 2030.<sup>75</sup> The NDC allocates emissions reductions among the sectors, with the most coming from energy (8,986 billion Mt CO<sub>2</sub>eq), then waste (2,112 billion Mt CO<sub>2</sub>eq), AFOLU (2,013 billion Mt CO<sub>2</sub>eq) and IPPU (732 billion Mt CO<sub>2</sub>eq). The NDC includes

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<sup>72</sup> Key commitments include: improving the quality of water-producing ecosystems, promoting climate-smart agriculture and silvo-pastoral systems, improving early-warning systems, including NBS into adaptation plans, implementing reforestation programs, and the sustainable management of coastal-marine areas.

<sup>73</sup> Government of Dominican Republic, *Updated National Determined Contributions Action Plan, NDC-RD* (Santo Domingo, DR, 2022).

<sup>74</sup> Government of Dominican Republic, *Updated National Determined Contributions, NDC-RD 2020* (Santo Domingo, DR, 2020).

<sup>75</sup> Government of Dominican Republic, *Updated National Determined Contributions, NDC-RD 2020*.

46 mitigation measures. It estimates the investment needed to achieve emissions reductions at around US\$8.9 billion.<sup>76</sup> The DR is a signatory to the Global Methane Pledge launched at COP26,<sup>77</sup> and the NDC contains a commitment to capture methane from landfill for energy.

**The country is developing a long-term climate strategy and addressing the intersection of climate and gender.** The DR has started the process of developing a 2050 low-carbon and resilient development strategy (LTS). The LTS will contain sectoral pathways and intermediate milestones to achieve net-zero and resilient development by 2050. It will inform future NDC updates and allow the country to plan short- and medium-term investments. Anchoring 2050 mitigation and adaptation targets in law would improve certainty and accountability. The 2018 Gender and Climate Change Action Plan includes measures to enable women and men to respond to climate change in a fair and equitable manner. The Plan proposes actions to tackle women's specific vulnerabilities to climate events, including their more limited opportunities and control of resources.

**Non-government stakeholders are involved in climate action but public knowledge of climate change is limited.** Civil society organizations and the private sector were actively involved in the 2020 NDC update and the latter are committed to transparency in their mitigation and adaptation efforts.<sup>78</sup> The Business Articulation Platform for Climate Action promotes GHG emissions reduction measures.<sup>79</sup> The DR has a base of national experts and an active cohort of environmental NGOs, and yet almost a fifth (18 percent) of the population reports never having heard of climate change and only 35 percent of people report knowing a moderate amount or a lot about it (figure 10).<sup>80</sup> The NCCC and the Ministry of Environment have the responsibility to promote understanding about climate change and the environment. In February 2020, the Council created a Consultation Committee for Climate Change to promote citizen engagement. The NDC committed to developing a National Strategy for Climate Empowerment Action.<sup>81</sup> Expanding the knowledge and role of non-government stakeholders could improve government decision making and increase accountability.

**Stakeholders would benefit from a consolidated historical statement of the country's mitigation commitments.** The country's emission reduction commitments have evolved over time, including the form in which they are expressed (see annex 5, table 1 for details). Such changes, when based on enhanced calculation data and the latest reporting practices, can improve accuracy. They do, however, make it difficult for stakeholders to follow the trajectory of the country's ambition. Enhanced transparency efforts are required to clarify and explain the changes in commitment forms and calculation bases, and to make these accessible to all stakeholders.

**The DR plays a key role as a member of the UNFCCC Transitional Committee on Loss and Damage (L&D), working to help operationalize a new global L&D fund and collect supporting information at the national level.** The purpose of the Fund is to assist developing countries that are particularly vulnerable to the adverse effects of climate change in responding to associated economic and non-economic loss and damage, including from extreme weather and slow-onset events. Many details related to Fund eligibility, scope, and modalities were yet to be resolved during CCDR preparation and are therefore not covered in this report. At the national level, the DR is working to strengthen risk management policies and tools, adapting them to international commitments. First, to strengthen the institutional system of risk management and climate change, work is being done to update and interconnect the legal frameworks of both fields. Similarly, vulnerability assessment and damage accounting tools are being strengthened, with updates to key tools

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<sup>76</sup> Government of Dominican Republic, *Updated National Determined Contributions Action Plan, NDC-RD*.

<sup>77</sup> Climate and Clean Air Coalition, *Global Methane Pledge* (2021), <https://www.globalmethanepledge.org/#pledges>.

<sup>78</sup> Government of Dominican Republic, *Updated National Determined Contributions, NDC-RD 2020*.

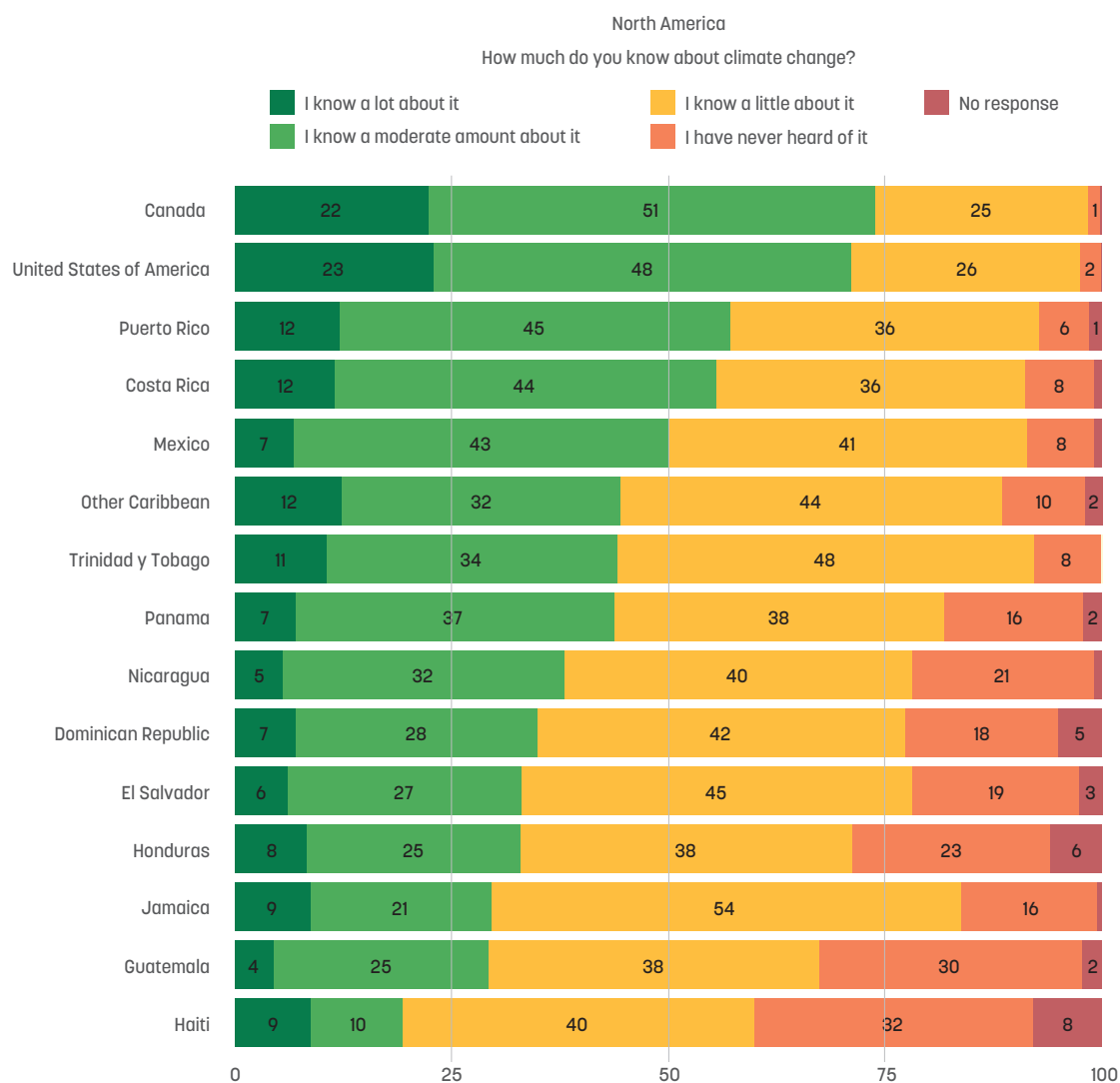
<sup>79</sup> World Bank internal paper based on Factor Global analytical work, *Decarbonization pathways for the Dominican Republic: Assessment and implementation of the NDC. First Report* (2022).

<sup>80</sup> A. Leiserowitz, J. Carman, N. Buttermore, L. Neyens, S. Rosenthal, J. Marlon, J. Schneider, and K. Mulcahy, *International Public Opinion on Climate Change* (New Haven: Yale Program on Climate Change Communication and Data for Good at Meta, 2022), <https://climatecommunication.yale.edu/wp-content/uploads/2022/06/international-public-opinion-on-climate-change-2022a.pdf>.

<sup>81</sup> Government of Dominican Republic, *Updated National Determined Contributions, NDC-RD 2020. Objectives 19 and 20* (Santo Domingo, 2020), <https://unfccc.int/sites/default/files/NDC/2022-06/Dominican%20Republic%20First%20NDC%20%28Updated%20Submission%29.pdf>.

such as the Climate Shock Vulnerability Index (IVACC), the Damage Assessment and Evaluation System (SIREN), and the development of new tools such as the Environmental Damage and Needs Assessment Guide (EDAN-A) for estimating losses and response actions in the environmental field.

**FIGURE 10.** Knowledge of climate change is low

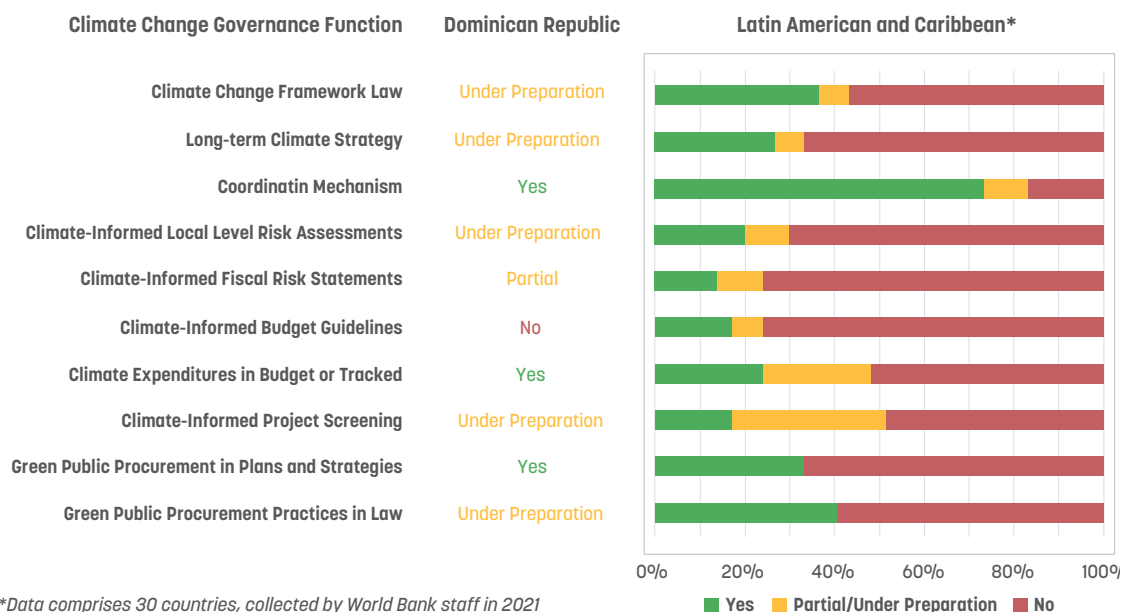


Source: Yale Program on Climate Change Communication and Data for Good at Meta (2022)

## 2.2. A climate law to address institutional overlaps and challenges with coordination

Out of 10 key climate change functions identified by the World Bank for countries globally, the Dominican Republic has only three in place—namely, a coordination mechanism, tracking of climate expenditures in the budget, and a national green public procurement policy (figure 11). Another five functions are under preparation: a framework climate change law, a long-term climate strategy, local-level risk information, climate-informed project screening, and a law to mandate green public procurement practices. A ninth function (climate-informed fiscal risk statements) has so far been partially achieved. However, even those elements that are in place could be strengthened to better support the DR to achieve its climate goals.

**FIGURE 11.** Progress in establishing core climate change governance functions



**Inter-institutional coordination remains a major challenge even with the existence of a dedicated coordination agency.** In 2008, the DR established a high-level coordination body, the NCCC (Decree 601-08).<sup>82</sup> The Council is chaired by the President of the Republic and has wide membership from across national public sector agencies. Its executive office is housed under the Presidency. Despite these features, coordination remains a challenge. The Council has only officially met twice in 15 years, with both of those occurring during the term of the current administration.<sup>83</sup> Disagreements among different national government agencies over roles and responsibilities (e.g., long-term planning and project implementation) and a duplication of efforts (for example, production of risk information) lead to inefficiencies and delays. The country would benefit from considering the experience of other countries with different climate change coordination structures (see annex V). Most countries now recognize that climate change is more than an environmental issue and needs to be led by a body with the power to influence action across the whole of government and beyond. The Dominican Republic could benefit from greater vertical coordination, by better incorporating subnational governments in climate planning, implementation, and monitoring. Overall, the country would benefit from reforms that address the current ambiguities of mandates among different ministries and the Council. But a greater role for independent expert sources and civil society might help shift the conversation toward action and away from inter-agency debates.

**There are inconsistencies, gaps, and overlaps in DR's climate change regulatory framework (see annex 5 for details).** The current mix of older laws and newer presidential decrees and ministerial resolutions impedes effective action. Emission reduction targets are inconsistent among the National Development Strategy, the National Multi-Annual Public Sector Plan, and the NDC. Gaps in the regulatory framework include a lack of definitions of key terms such as "climate change," "greenhouse gas," "mitigation," and "adaptation." Gaps and overlaps exist in institutional mandates, roles, and responsibilities. For example, no agency is assigned the function of leading the development of and approving a long-term climate strategy. The responsibility to mainstream climate change in plans, programs, projects, and policies is jointly assigned to MEPYD, the

<sup>82</sup> Government of the Dominican Republic, *Decree 601-08* (Santo Domingo, DR, 2008), <https://cambioclimatico.gob.do/phocadownload/SobreNosotros/MarcoLegal/dec-no-601-08.pdf>.

<sup>83</sup> Consejo Nacional para el Cambio Climático y Mecanismo de Desarrollo Limpio (CNCCMDL), *press release April 22, 2023*, (Santo Domingo, DR, 2023), <https://cambioclimatico.gob.do/index.php/noticias/item/447-presidente-abinader-propone-gran-pacto-entre-gobierno-partidos-politicos-y-sociedad-civil-para-enfrentar-cambio-climatico>.



Ministry of Environment, and the NCCC,<sup>84</sup> but no procedures exist on how this shared function is to be undertaken. The responsibility to build national capacity on climate change is assigned to both the Ministry of Environment<sup>85</sup> and the Council.<sup>86</sup> Both the Ministry of Environment and the Council act as the primary entry points for any communication and collaboration to the UNFCCC, but formal institutional arrangements for reporting remains a challenge.<sup>87</sup> These ambiguities create uncertainty and make it difficult for national government agencies, subnational governments, the private sector, and households to understand their respective responsibilities.

**A framework climate change law could improve the regulatory framework and enhance government effectiveness and accountability.** The DR has committed to developing a national climate change framework law as part of its 2020 NDC Update.<sup>88</sup> Such a law could create a credible commitment to the current government's goal of carbon neutrality by 2050, establish binding adaptation targets and mandate the requirement of a long-term strategy. It could also establish a clear hierarchy and alignment of strategies, plans, policies, and programs, and clearly assign the functional mandate for developing and approving such instruments to various agencies. A law could also help address current challenges with coordination. Furthermore, it could bolster the role of local governments, civil society, and independent expert advice in climate action. All these factors could contribute to increased effectiveness and address the ambiguities of the current regulatory framework. A national climate change framework law would provide greater certainty for private investors and given the independence of the judiciary could enable affected parties to hold the government accountable through the courts, thereby improving implementation.<sup>89</sup> Global experience suggests that climate laws are likely to be most effective if developed through an inclusive and transparent process. A number of draft laws already exist, and the country would benefit from a consolidation of the separate drafting processes to bring this to conclusion.

### **2.3. More comprehensive data to improve government and private decision making**

**Improved data and information transparency would support the achievement of the Dominican Republic's climate goals.** There is a need for up-to-date, comprehensive, and publicly available data on climate risks, policy actions, and investments to assist government, businesses, and households to make informed decisions. A national measurement, reporting and verification (MRV) system was legally established in 2020 but is not yet operational.<sup>90</sup> The last biennial update report to the UNFCCC was submitted in February 2020 but is largely based on a 2010 inventory. There is a need to improve geographically disaggregated information on climate risks and vulnerabilities. There are also institutional ambiguities and overlaps in the collection, verification, and sharing of data. Both the MEPyD and the NCCC are developing platforms of climate risk data disaggregated to the municipal level.

**The country is enhancing the collection and management of climate vulnerability and risk information but needs to ensure it is easily accessible.** The NCCC and the French Development Agency have produced studies on climate vulnerabilities in food and agriculture. The IVACC, created in 2014, estimates household vulnerability to climate events given household socioeconomic characteristics and geography (further details in chapter 4).<sup>91</sup> In 2021, MEPyD created the Disaster Risk Management and Climate Change

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<sup>84</sup> This includes the key line ministries of Agriculture, Foreign Affairs, Treasury, Energy and Mines, Industry, Commerce and Enterprises, Public Health, and Social Assistance and Tourism, along with the Central Bank, the National Energy Commission and the Energy Superintendent.

<sup>85</sup> Government of Dominican Republic, Resolution No. 0027-2021, Art 42 (2021).

<sup>86</sup> Government of the Dominican Republic, Decree 601-08 (Santo Domingo, DR, 2008), <https://cambioclimatico.gob.do/phocadownload/SobreNosotros/MarcoLegal/dec-no-601-08.pdf>.

<sup>87</sup> Ministry of Environment and Natural Resources, National Council for Climate Change and Clean Development Mechanism, and United Nations Development Program, *First Biennial Update Report Update of the Dominican Republic*.

<sup>88</sup> Government of Dominican Republic, *Updated Nationally Determined Contributions* (Santo Domingo, DR, 2020), <https://unfccc.int/sites/default/files/NDC/2022-06/Dominican%20Republic%20First%20NDC%20%28Updated%20Submission%29.pdf>.

<sup>89</sup> Citizens can make complaints to the Attorney General's Office for the Defense of the Environment, which bring cases for non-compliance with environmental laws.

<sup>90</sup> Government of the Dominican Republic, *National System for Measuring, Reporting and Verification*. Decree No. 541-20 (Santo Domingo, DR: 2020).

<sup>91</sup> Presidency of the Dominican Republic, *Unified System of Beneficiaries, Climate Shock Vulnerability Index*. (Santo Domingo, DR, 2022), <https://storymaps.arcgis.com/stories/1b7adb61f8d84df993e6b9fe95a8d500>.

Directorate under the Vice Ministry of Territorial Planning and Regional Development. The Directorate is developing a climate vulnerability index of livelihoods and economic activities at the municipal level that includes measures of household livelihoods, climate vulnerability of human settlements, climate vulnerability of tourism, and climate vulnerability of the agricultural sector.<sup>92</sup> The public availability of this information, in an easily digestible format, will assist households, businesses, and all levels of government to make better-informed investment decisions.

## 2.4. Subnational governments for climate action

**Subnational governments play a critical role in climate change but lack certain important capacities to fulfill their mandates.** Municipalities have authority over issues central to decarbonization, adaptation and disaster response, such as spatial planning, solid waste management, urban transport and environmental protection (shared with the national government). But in general, subnational governments lack the human and financial resources to properly fulfill their responsibilities. This is a product of the fragmentation and small size of local governments, and of the high centralization of budget management, with the DR allocating one of the lowest shares of public spending and investment to local governments in Central America.<sup>93</sup>

**The governance framework for territorial planning is being strengthened but implementation will require significant resources.** The DR strengthened its legal framework for subnational response to climate change with the passage of the 2022 Law on Territorial Planning, Land Use, and Human Settlements (368-22). The country has been working on the implementation of a national territorial development plan and will need to issue regulations under the law.<sup>94</sup> The law mandates that local governments include climate change adaptation and resilience in their development and land-use plans.<sup>95</sup> Only five percent of municipalities currently have local land-use plans.<sup>96</sup> Adaptation plans exist for a few municipalities at high risk of climate change: Samaná, Santo Domingo, Miches, and Pedernales.<sup>97</sup> To capitalize on recent legal progress, subnational governments will require significant strengthening, which will be challenging given the small size and limited capacity of many municipalities.<sup>98</sup> The Ministry of Planning, Economy and Development and the Ministry of Environment, along with non-government organizations, are providing support to municipalities to fulfill their enhanced climate responsibilities.

## 2.5. Better use of public finances to address climate change

**The DR is undertaking efforts to link its climate goals to action through public finances.** The 2023 fiscal risk statement includes a consideration of climate change focused on natural disasters.<sup>99</sup> This could be enhanced with a consideration of slow-onset physical risks and transition risks associated with decarbonization. The government is currently piloting a methodology to reflect strategic priorities in the annual budget, with climate change and protection of the environment as one of nine priorities in the 2023 budget. The 2023 budget and supporting documents include, for the first time, a classification of

<sup>92</sup> MEPyD, Presentation at UNFCCC COP27 (2022).

<sup>93</sup> J. Martinez, A. Radics, and B. Perez Rincon, *Decentralization in the Dominican Republic: Current Performance and Perspectives on Reform* (Washington, DC: Inter-American Development Bank, 2017), <https://publications.iadb.org/publications/spanish/viewer/Descentralizaci%C3%B3n-en-Rep%C3%BAblica-Dominicana-Desempe%C3%B1o-actual-y-perspectivas-de-reforma.pdf>.

<sup>94</sup> GFDRR (Global Facility for Disaster Reduction and Recovery), *Enhancing resilient territorial development in the Dominican Republic* (2022), <https://www.gfdr.org/sites/default/files/Project%20Fiche-Enhancing%20Resilient%20Territorial%20Development%20in%20the%20Dominican%20Republic.pdf>.

<sup>95</sup> Government of the DR, *Law on land use, land management and human settlements, 368-22* (Santo Domingo, DR, 2022), <https://mepyd.gob.do/ley-368-22-establece-marco-regulatorio-integral-para-garantizar-el-ordenamiento-del-territorio>.

<sup>96</sup> World Bank, *Paving the way for prosperous cities and territories: Urbanization and Territorial Review of the Dominican Republic* (Washington, DC: World Bank, 2022), <https://doi.org/10.1596/37710>.

<sup>97</sup> Fundación Plenitud, DAI SPRL, and IRMA, *Análisis de riesgo ante al cambio climático; GFDRR, Enhancing resilient territorial development*.

<sup>98</sup> J. Martinez, A. Radics, and B. Perez Rincon, *Decentralization in the Dominican Republic: Current Performance and Perspectives on Reform* (Washington, DC: Inter-American Development Bank, 2017), <https://publications.iadb.org/publications/spanish/viewer/Descentralizaci%C3%B3n-en-Rep%C3%BAblica-Dominicana-Desempe%C3%B1o-actual-y-perspectivas-de-reforma.pdf>.

<sup>99</sup> Government of the Dominican Republic, *General Budget Bill 2023* (Santo Domingo, DR, 2023), <https://www.hacienda.gob.do/wp-content/uploads/2022/09/Proyecto-de-Ley-Presupuesto-General-del-Estado-2023-1.pdf>.

climate-related spending (see annex 5).<sup>100</sup> The public investment management system does not yet contain measures to assess projects based on climate criteria, though the government is in the early stages of implementing such a reform. The 2021 National Policy of Sustainable Public Procurement explicitly supports environmental and social criteria in bid assessment and awards and has been implemented with training and awareness raising for contracting authorities and suppliers. A draft public procurement law mandating the use of sustainability principles is currently before the DR Congress. The law would also be critical for increasing the fiscal space for climate action (see box 4.1, chapter 4). In the meantime, the government is issuing a regulation under existing laws to mandate the use of environmental and social sustainability criteria in all public procurement.

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<sup>100</sup> General Directorate of Budget, *System for the Identification and Classification of Public Expenditure on Climate Change and Disaster Risk Management* (Santo Domingo, DR, 2022), <https://www.digepres.gob.do/wp-content/uploads/2022/07/Documento-clasificador-funcional-de-Cambio-Clim%C3%A1tico.pdf>.

### 3. Selected Development and Climate Priorities

#### Main Messages

- Enhanced adaptation measures will be needed to sustain the country's development path and foster growth.
- Improved water infrastructure will be necessary, specifically improving irrigation efficiency and increasing the volume of reservoirs designated for irrigation purposes, in order to significantly address unmet water demand by 2050. Additional adaptation measures could include increasing the resilience of the agricultural sector to foster food security, WASH investments and resilient infrastructure.
- Achieving the NDC2030 commitment and deep decarbonization in the power sector by 2050 are both possible with steady and aggressive integration of renewable energy. Transitioning away from coal-fired power is essential to achieving the government's carbon neutrality target and makes economic sense without compromising energy security. In the transport sector, modal shifts, electrification, and efficiency improvement of vehicles, should be core components of an integrated transport policy to reduce the carbon intensity of the sector.
- The transport sector and AFOLU decarbonization pathways will need to be defined and implemented to achieve zero net carbon.

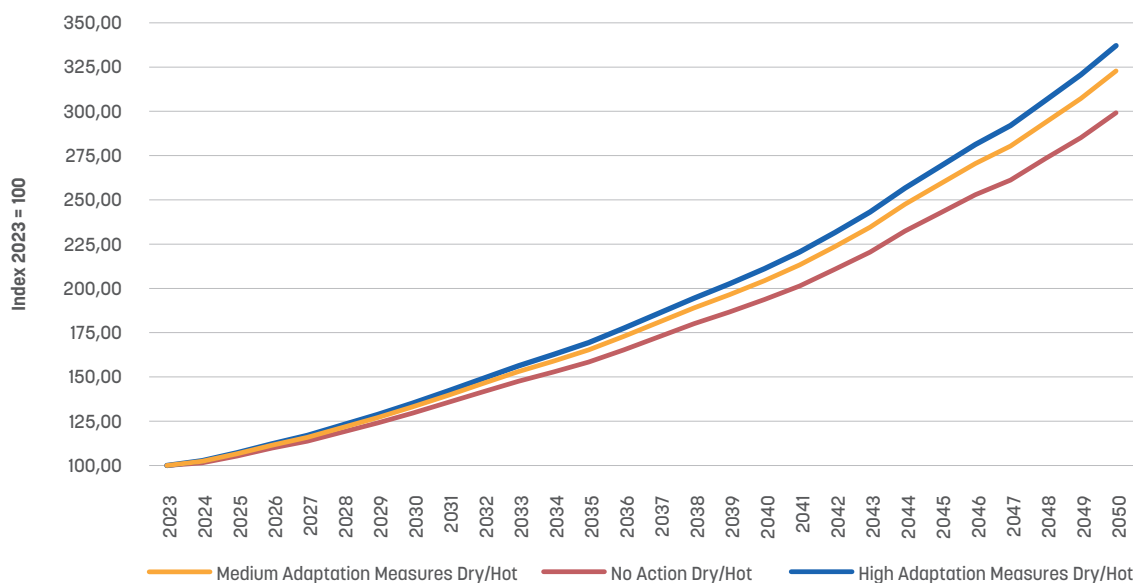
#### 3.1. Investments in adaptation and resilience to reduce economic impact of climate change

**Given the significant anticipated impacts of climate change and the country's vulnerability, climate change adaptation and increasing resilience are a priority for the DR.** In a hot/dry climate scenario up to 16.7 percent of GDP could be lost relative to the baseline. The adoption of measures to reduce direct damage from erosion on crop production, inland flooding, sea-level rise, and tropical storms could reduce the potential macroeconomic impacts by up to 10 percentage points (60 percent reduction) by 2050 (see blue line in figure 12).<sup>101</sup> These investments, if well designed and implemented, could directly ameliorate climate impacts, enhance economic productivity, and provide development and environmental benefits. Although not all of these benefits can be quantified, acknowledging them is important for understanding the full impact of these investments. The resilience interventions discussed below focus on policy recommendations and investments in water and agriculture, labor productivity protection measures, disaster resilience, NBS, and adaptive social protection.

**Investments in adaptation are expected to alleviate the increase in poverty because of climate change.** Under two levels of adaptation measures, high and medium, the increase in the poverty headcount because of climate change would be almost entirely neutral. The projected poverty rate increase by 2050 in the combined dry/hot scenario (0.8 percentage points) would fall by between 0.7 to 0.5 percentage points if adaptation measures are implemented to alleviate climate impacts on poverty reduction. In the combined wet/warm scenario—a projected poverty increase of 0.5 percentage points—could be reduced by between 0.4 and 0.2 percentage points through proactive adaptation measures. A further mitigation scenario—additional electrification of transport plus a corresponding adjustment to the electricity generation/power mix—would have a negligible impact on poverty. On the other hand, in a mitigation scenario that targets a net zero pathway, poverty would be slightly higher—by 0.2 percentage points—than the scenario without climate change.

<sup>101</sup> Simulations consider the following channels: labor heat stress, crops-erosion, crops-rainfed and irrigated, inland flooding, sea-level rise and storm surge, and tropical storms. Adaptation from labor heat stress: Increased used of air-conditioning reduces the decline in labor productivity. Adaptation measures for crops – rainfed and irrigated include irrigation (rainfed crops), reduced unmet demand (irrigated crops), heat-tolerant varieties, and crop switching.

**FIGURE 12.** Total GDP loss under dry/hot scenario, with adaptation measures<sup>102</sup>



Source: World Bank Staff calculation based on macro scenarios and simulations prepared by Industrial Economics for this report with further details in annex 1 and 2 (2023).

### 3.1.1. The climate vulnerability of integrated water and agricultural systems

#### **Water sector resilience requires both policy reforms and investment in enhanced storage capacity.**

Policy reforms in the water sector could help improve the overall functioning of the sector and balance the needs of multiple users —specifically, the adoption and implementation of a water law to create a water regulatory body separate from operations and to establish a system of water rights grantable to owners, possessors, and tenants of defined properties. Efforts to socialize these changes and build up an understanding of the importance of water resources will also help facilitate shifts away from thinking of water as an unlimited free resource. Investments involve improving irrigation efficiency and increasing the volume of reservoirs designated for irrigation purposes to contribute to sustaining agricultural production.

**Modeling conducted for this report shows that, both in the Dry/Hot and Wet/Warm scenarios, improving irrigation efficiency from 20 to 40 percent, and increasing the volume of reservoirs by 20 percent, would result in positive changes in unmet irrigation water demand.** For example, the Dry/Hot scenario shows a change with respect to the no-adaptation case of around 30 percent. These adaptation strategies also have an effect on the municipal and industrial sectors by slightly decreasing water demand. Irrigation efficiency in the DR can be improved through changes in technology, for example, a change from gravity-fed irrigation to drip or sprinkler irrigation. There are also potential synergies with climate change mitigation if renewable sources are used to power the irrigation systems. Increasing the storage capacity of existing reservoirs could be achieved by raising dams, which would be more cost effective and incur in lower environmental impacts than building new ones. Managing and reducing sedimentation is another cost-effective measure that would increase storage capacity.

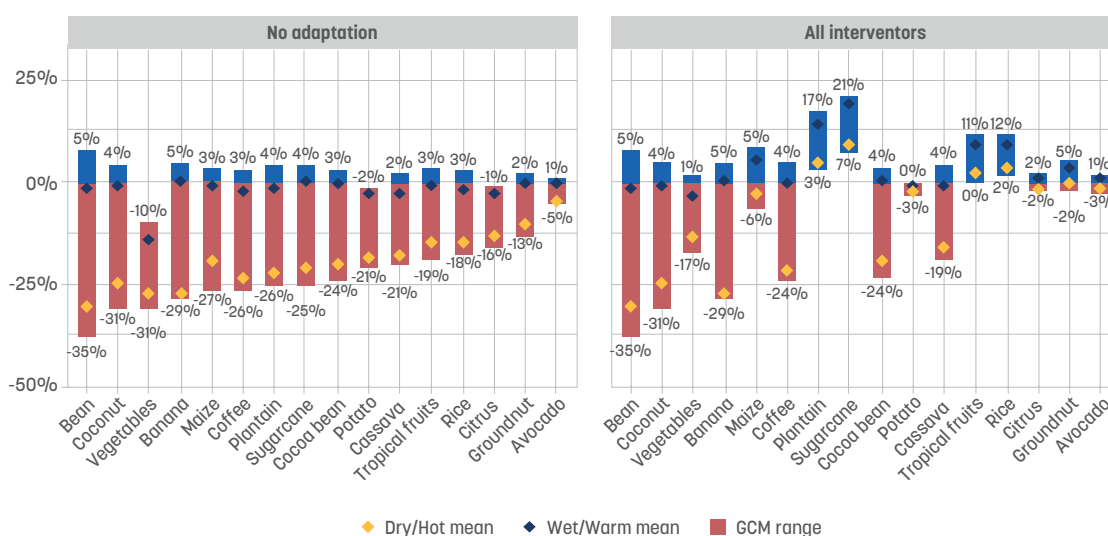
**Agriculture sector resilience requires expanded and more efficient irrigation.** Modeling shows that expanding irrigation and increasing its efficiency could result in the highest gains of all possible adaptation interventions (see annex 2 for more detail).<sup>94</sup> These gains would roughly offset climate impacts under a Wet/Warm scenario. Other interventions with significant potential, include: i) building agroclimatic zoning information for key value chains; ii) identifying suitable technological packages and providing farmers with

<sup>102</sup> Wet/warm results adaptation measures align with the reduction of the dry/hot scenario.

training and technical assistance; iii) facilitating access to credit for the upfront costs of investment; and iv) establishing cost-effective monitoring, reporting and verification of impacts (MRV). Measures such as the use of heat-tolerant crop varieties and crop switching have smaller and more localized benefits.

**Figure 13 shows the effects on crop production when adaptation interventions are employed.** Overall, these interventions are expected to have positive impacts on most crops, but, crops such as beans, coconuts, and bananas are not protected from shocks. Promoting an integrated territorial and landscape approach to agricultural infrastructure investments could also help improve agriculture resilience amid extreme events and other climate impacts.<sup>103</sup>

**FIGURE 13.** Crop Production Shock with all Adaptation Interventions 2041–2050



Source: Simulations prepared by Industrial Economics for this report with further details in annex 2 (2023).

**Agriculture and water use will also be impacted by the increasing demand for water by tourism, reinforcing the need to promote water efficiency and conservation to increase the sector's resilience.**

The Hydrological Plan of the DR (2010) predicts that water demand in the tourism sector will surge from 27.38 mm<sup>3</sup>/year in 2010 to 84.85 mm<sup>3</sup>/year by 2025. A pressing challenge is the current low tariffs on water usage, which fail to incentivize conservation.<sup>104</sup> To promote water efficiency and conservation in the sector, there are different approaches that could be implemented. These include price-based instruments (using tariff structures such as raised tariffs, taxes, incentives (for water savings and reuse), or complements such as seasonal pricing, time-based tariffs, and water budgets); and non-price-based instruments using water efficiency systems (for example, reduced tap flow and dual-flush cisterns), reusing treated water (for example, for irrigation and golf courses), and utilizing rainwater.

**3.1.2. Adaptation strategies focused on labor supply and health to reduce the impact of climate change on human capital**

**Energy efficiency and sustainable energy management should be prioritized to mitigate excess mortality from heat stress and to maintain productivity.**

Interventions include changing the time of day that outdoor physical labor is conducted (for example, more work during the early morning and evening), investing in active or passive cooling technologies (for example, improved ventilation, fans or air-conditioning), and

<sup>103</sup> The DR is implementing a project to improve the resilience and management of hydraulic infrastructure in the Yaque del Norte and Ozama-Isabela river basins, economically considered the two most important in the country. The project aims to develop, improve and support the rehabilitation, maintenance, management, and operation of existent irrigation infrastructure. This initiative could be replicated in other river basins and watersheds to promote adaptation and decrease the sector's vulnerability to climate change.

<sup>104</sup> MEPyD, *Pacto Nacional del Agua, 2021-2036* (Santo Domingo, DR, 2021), <https://mepyd.gob.do/wp-content/uploads/drive/DCS/Adjuntos/PACTO%20AGUA%20-%20-%20Compromiso%20Nacional%20del%20Agua%20-%20Final%2017-6-21.pdf>.

minimizing the urban heat island effect (for example, through the use of green roofs, tree-planting, and so on). This CCDR assessed the impact of increasing air-conditioning for indoor workers (annex 2) and found that adaptation investments in air-conditioning have the greatest impact on the industrial sector, followed closely by services. Under the high adaptation scenario, which considers increasing AC coverage by 30 percent by 2050 (reaching 60 percent coverage), industrial labor productivity is projected to fluctuate between 0.5 percent and -2.8 percent. This contrasts with a decline of between -9.1 percent and -5.1 percent in the no-action scenario. Increasing AC access for indoor workers could help industry and service sectors with predominantly indoor jobs in a Wet/Warm scenario. However, agriculture and other outdoor workers would require further adaptation measures.

**Enhanced investments in water sanitation and hygiene are needed to reduce the incidence of water-borne diseases.** The CCDR assessed the incidence of water-borne diseases and related mortality under three WASH investment scenarios. The country is starting from relatively high coverage and recent improvements. In 2020, 87.2 percent of Dominicans had basic sanitation, a percentage that grows under the 2030 BAU and aspirational scenarios to 91 percent and 98.6 percent, respectively. The analysis shows that improvements in WASH can soften the impact of climate change on human capital. Both the BAU and aspirational assumptions would result in benefits. Detailed information is included in annex 2. Achieving these improvements will require, in addition to the legal and regulatory reforms discussed above, the implementation and expansion of the modernization program on water supply and sanitation to reduce water losses (commercial and physical), improvement in energy efficiency and in service quality of WSS, while implementing performance measurement.

**Recognizing the vulnerabilities of the health sector, the DR joined the COP 26 Health Program in November 2021 and committed to creating a climate-resilient and low-carbon health system.**<sup>105</sup> Furthermore, the DR is currently in the process of developing an Epidemiological and Environmental Surveillance System for the Prevention and Control of Respiratory Infectious Diseases Associated with Climate Change. One of this system's main objectives is to develop mitigation and adaptation strategies to address the impact of climate change on air quality and, in turn, on respiratory infectious diseases.<sup>106</sup>

### 3.1.3. Fostering disaster resilience through infrastructure investment

**The government is undertaking efforts to build the resilience of key sectors: energy, transport and housing through regulation and institutional reform.** In the energy sector, the *Superintendencia de Electricidad* (SIE, the sector regulator) issued, in December 2022, a regulation for the technical standards of the power grid, mandating its climate resilience, through the use of future investments in underground power lines, as well as to support the integration of renewable energy into the power system.<sup>107</sup> In the transport sector, road asset management will need to shift toward proactive performance-based contracting, including for maintenance, to improve asset life and climate-resilience, thereby optimizing public spending.<sup>108</sup> The Ministry of Housing established, in 2021, aims to improve the country's housing resilience. Its policies and programs focus on affordable, inclusive and green housing to promote resilience and recovery.<sup>109, 110</sup>

<sup>105</sup> The 26th United Nations Climate Change Conference (COP 26) Health Program is a partnership between the government of the UK, PAHO, UNFCCC, and the World Health Organization. WHO, COP 26 Health Program (2022), <https://www.who.int/initiatives/alliance-for-transformative-action-on-climate-and-health/cop26-health-programme>.

<sup>106</sup> DR Ministry of Public Health and CDC, *Program for the development of an epidemiological and environmental surveillance system for the prevention and control of respiratory diseases associated with Climate Change in the Dominican Republic ARPA-PRDS* (Santo Domingo, DR, 2023), <https://www.paho.org/es/noticias/25-7-2023-republica-dominicana-desarrolla-proyecto-para-prevencion-control-enfermedades>.

<sup>107</sup> Superintendencia of Electricity (SIE). *Resolution No. SIE-143-2022-MEMI* (Santo Domingo, DR, 2022), <https://sie.gob.do/wp-content/uploads/2022/12/SIE-143-2022-MEMI-Regl.-Tecn.-Calidad-Servicio-Distr-pdf>.

<sup>108</sup> World Bank, *Country Partnership Framework*. The climate resilience of port, trade, and logistics infrastructure and potential options for mitigating those risks are beyond the scope of this report and merit follow-up studies.

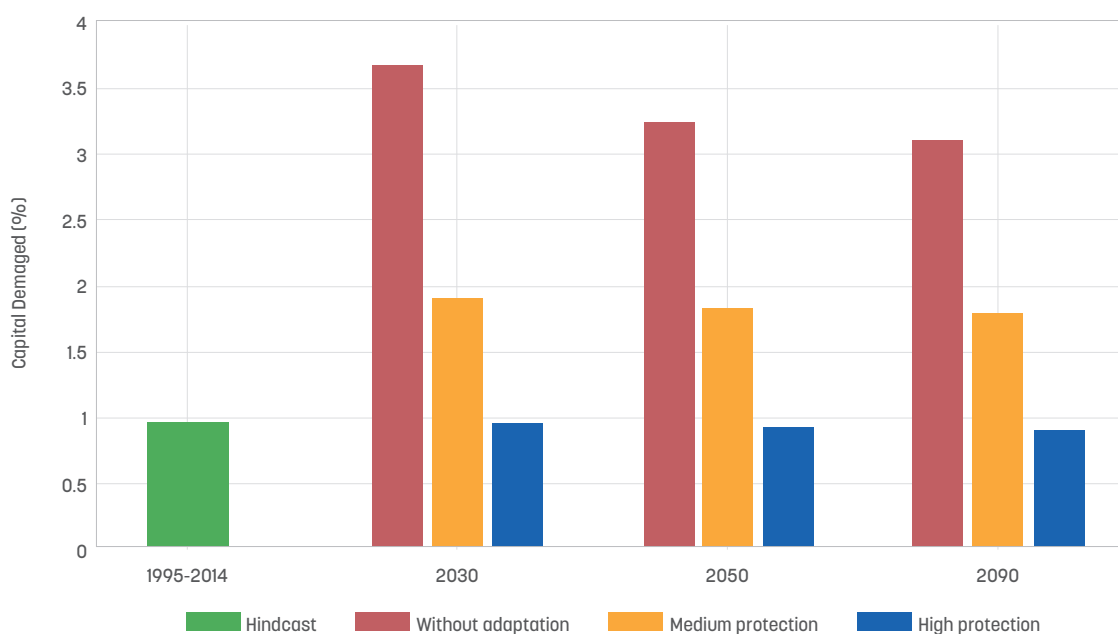
<sup>109</sup> Caribbean Regional Resilience Building Facility, *Strengthening disaster and climate change resilience in the housing sector in the Dominican Republic* (EU: GFDRR and World Bank, 2023), [https://www.gfdr.org/sites/default/files/Dominican%20Republic%20-%20Strengthening%20disaster%20and%20climate%20change\\_final.pdf](https://www.gfdr.org/sites/default/files/Dominican%20Republic%20-%20Strengthening%20disaster%20and%20climate%20change_final.pdf).

<sup>110</sup> The *Proresiliencia* program focuses on the development of climate-resilient plans and infrastructure, with an emphasis on four provinces: Monte Cristi, Puerto Plata, and Espaillat y Duarte.

The efforts above represent significant first steps in developing institutions to support greater resilience in the built environment and could be augmented through additional policies and investments. Policy measures that could support enhanced resilience in the built environment include implementing territorial planning reforms to incorporate DRM in land use planning, improving the availability of data on hazards and risk exposure, and the adoption of building code standards with a focus on multi-hazard risk to reduce future exposure to hazards. For existing infrastructure, investments in resilience could reduce damage and shorten recovery times.

**Planning and building new infrastructure higher than future sea levels and storm surge levels could significantly reduce capital damage.** This CCDR assessed the impact of undertaking adaptation interventions focused on i) building future infrastructure at an elevation above the projected 2050 sea level (under the SSP3-7.0 climate scenario) and ii) building sea walls to protect the structures with the highest annual expected damage in 2050 (under SSP3-7.0). High protection (that is, building seawalls when the benefit-cost ratio exceeds 1)<sup>111</sup> has a significant and rapid impact, with capital damage from coastal flooding reduced by around 15 percent relative to baseline beginning in the 2030s (see annex 2).

**FIGURE 14.** Expected annual wind damage from tropical cyclones under SSP3-7.0, with and without adaptation



Source: Simulations prepared by Industrial Economics for this report with further details in annex 2 (2023).

**Specific adaptation measures to increase the resilience of infrastructure against the wind impacts of tropical cyclones.** This CCDR analyzed the impact of an adaptation intervention in which i) roof connection anchors are improved; and ii) connection anchor bolts and stiffeners are added for a cost of 10 percent of the building’s cost and a 50 percent reduction in losses because of wind. Figure 14 shows the expected annual damage from tropical cyclones in the country (expressed as a percentage of the entire capital stock that is damaged in any given year over the baseline) for the SSP3-7.0 climate scenario. It compares the damage without adaptation, with medium protection (intervention implemented where BCR>4), and with high protection (implemented where BCR>1). Without adaptation, capital damage represents 3.2 percent of total capital stock in 2050 (figure 14). Introducing these interventions could reduce damage to capital stock by 43 to 72 percent, respectively.<sup>112</sup>

<sup>111</sup> Adaptation is applied using a benefit-cost test, where the benefits are the mean expected avoided damage over a 20-year planning horizon, and the costs are the value of a structure as a share of national capital stock. Two adaptation levels are considered for the intervention: high adaptation, where adaptation is applied when the benefit-cost ratio exceeds 1, and medium adaptation, where adaptation is applied only when the benefit-cost ratio exceeds 4. More information is included in annex 2.

<sup>112</sup> The analysis assumed two levels of adaptation implemented: i) high adaptation, in which the benefit-cost ratio exceeds 1, and ii) medium adaptation, in which the benefit-cost ratio exceeds 4. More information is included in annex 2.



### 3.1.4. Nature-based solutions to complement adaptation strategies in select sectors

**NBS will be critical given the estimated impacts of climate change on agriculture, water, infrastructure and tourism.** NBS reduce climate risks while enhancing biodiversity and ecosystem services. NBS investments can be vital engines of job creation, with estimates suggesting that up to 750 full-time equivalent jobs can be created in developing countries for every US\$1 million invested.<sup>113</sup> There are many other potential activities but it is important to consider that the design and implementation of NBS requires a systems approach that considers the landscape ecology, functions of gray infrastructure, and the location of the project. Examples of NBS strategies that could be applied in the DR include:

**NBS for water storage.** Incorporating NBS into landscape management can change soil structure and improve infiltration capacity, which helps groundwater recharge and improve water availability.<sup>114</sup> Some of the NBS that could be implemented for water retention and storage include i) conservation, creation, or improvement of natural areas and spaces to serve as temporary storage for water, for example, green areas and wetlands; ii) creation of artificial water bodies; and iii) aquifer recharge techniques, development, or restoration of green areas and reforestation.

**Reducing flood risks in urban areas.** NBS can reduce flood risk through water infiltration, retention, and mitigation of surface runoff. Examples include green roofs, permeable pavements, bioretention areas, and open spaces such as parks. In urban areas, the reduction of flood risks can potentially stimulate investment and development.<sup>115, 116</sup>

**Increasing coastal resilience through the restoration of mangrove and reef ecosystems.** Increasing mangrove and coral reef ecosystems can help prevent waves and storm surges from reaching the coastline. In the DR, it is estimated that US\$96 million of damage (approximately 0.11 percent of GDP) is averted annually through the presence of coral reefs.<sup>117</sup> Coral reef and mangrove restoration efforts result in a benefit-cost ratio greater than 15:1 in some parts of the country.<sup>118</sup>

**Agroforestry.** Implementing agroforestry practices to restore agricultural land can improve crop yields and reduce the risk of crop failure.<sup>119</sup> Agroforestry provides benefits such as shade for crops, livestock, and people, soil stabilization to prevent erosion, improved soil nutrition and structure, and products such as food, fodder, and fuel. To be considered an NBS, agroforestry must also benefit local biodiversity and the health of local ecosystems.<sup>120</sup>

**NBS and specifically sustainable landscape management that improves carbon sinks, will benefit adaptation efforts while fostering poverty reduction.** Although the contribution of the forest sector to GDP is small (on average, 0.5 percent, which is 7–10 times lower than small Caribbean country, regional and world

<sup>113</sup> UNEP (United Nations Environment Programme), *Smart, Sustainable and Resilient Cities: The Power of Nature-based Solutions* (Nairobi, Kenya: UNEP, 2021), <https://wedocs.unep.org/bitstream/handle/20.500.11822/36586/SSRC.pdf?sequence=1&isAllowed=y>.

<sup>114</sup> Although studies that value a change in water provisioning from NBS are limited, an assessment in Indonesia estimated that forest restoration and improved land management could increase groundwater recharge by up to 6.1 percent a year, thus contributing to a reliable water supply for industrial activities in the watershed. See Boris Ton Van Zanten, Gonzalo Gutierrez Goizueta, Luke Mckinnon Brander, Borja Gonzalez Reguero, Robert Griffin, Kavita Kapur Macleod, Alida Ivana Alves Beloqui, et al., *Assessing the Benefits and Costs of Nature-Based Solutions for Climate Resilience: A Guideline for Project Developers* (Washington, DC: World Bank, 2023), <https://openknowledge.worldbank.org/handle/10986/39811>.

<sup>115</sup> Van Zanten et al., *Assessing the Benefits and Costs*.

<sup>116</sup> World Bank, *Nature-Based Solutions for Disaster Risk Management* (Washington, DC: World Bank, 2022), <https://documents1.worldbank.org/curated/en/908411551126569861/pdf/Fact-Sheet.pdf>.

<sup>117</sup> M. Beck, I. Losada, P. Menéndez, B. Reguero, P. Diaz-Simal, and F. Fernández, *The global flood protection savings provided by coral reefs*. *Nat Commun* 9, 2186 (2018), <https://www.nature.com/articles/s41467-018-04568-z>.

<sup>118</sup> M. Beck, N. Heck, S. Narayan, P. Menéndez, B. Reguero, S. Bitterwolf, S. Torres-Ortega, G. Lange, K. Pfliegner, V. Pietsch McNulty, et al., *Return on investment for mangrove and reef flood protection*. *Ecosystem Services* Volume 56 (2022), <https://www.sciencedirect.com/science/article/pii/S2212041622000365>.

<sup>119</sup> Leander Raes, Pauline Buffle, Zoe Williamson, Scarlett Benson, Helen Ding and James McBreen, *A guide to investing in landscape restoration to sustain agrifood supply chains: Reducing risks, raising resilience, reaping returns* (International Union for Conservation of Nature (IUCN) and the Food and Land Use Coalition (FOLU), 2023), <https://portals.iucn.org/library/sites/library/files/documents/2023-010-En.pdf>.

<sup>120</sup> Global Center on Adaptation, *Nature-based Solutions in Agroforestry* (Rotterdam: GCA, 2022), [https://gca.org/wp-content/uploads/2023/01/GCA\\_State-and-Trends-in-Adaptation-2022\\_NBS-in-Agroforestry.pdf](https://gca.org/wp-content/uploads/2023/01/GCA_State-and-Trends-in-Adaptation-2022_NBS-in-Agroforestry.pdf).

averages),<sup>121</sup> the sector is an important source of employment. Reforestation efforts, for example, have been successful in generating employment for rural populations.<sup>122</sup> Managing terrestrial and marine protected areas also supports nature-based tourism (NBT), which increases community income, improves environmental awareness, and enhances the role of rural women in promoting a culture of environmental sustainability.<sup>123</sup>

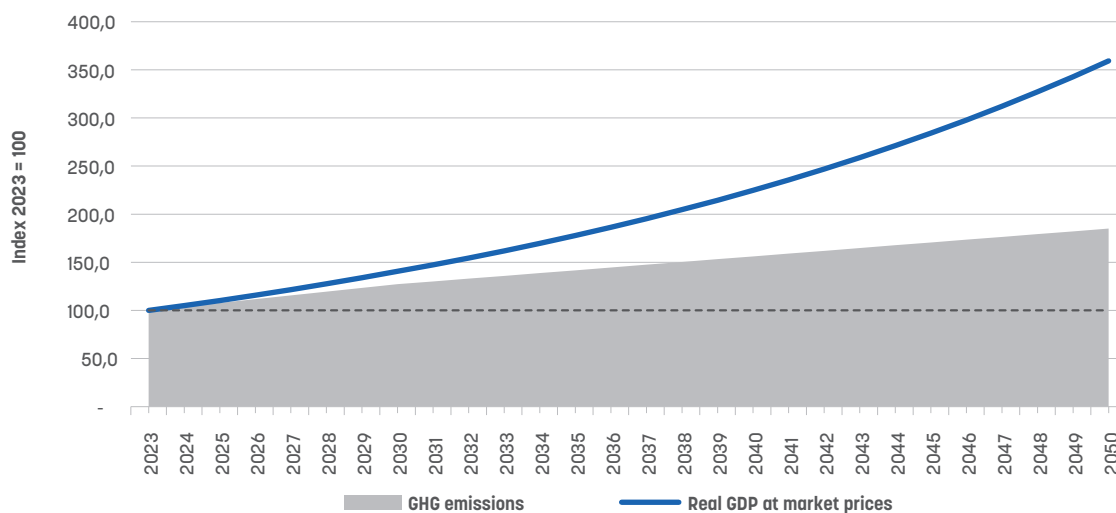
### 3.1.5. Strengthening adaptive social protection to mitigate impacts on households

**To further enhance household resilience, the DR could strengthen its Adaptive Social Protection (ASP) system by leveraging existing connections with DRM systems.** The country's ASP strengths lie in data and information, particularly in the social registry managed by the *Sistema Único de Beneficiarios* (SIUBEN).<sup>124</sup> Drawing from climate risk data, SIUBEN's IVACC combines vulnerability criteria with environmental exposure and socioeconomic fragility indicators. IVACC reflects the likelihood of a poor or vulnerable household being affected by a climatic event in order to provide information about resilience strategies, risk mitigation measures, and social protection support following climate shocks. By leveraging IVACC, the DR can enhance resilience among impoverished and vulnerable populations, enabling them to better prepare for, cope with, and adapt to shocks. Additional tools include the Emergency Assessment Tool (Ficha FIBE), which SIUBEN collects during emergencies from affected households. This rapid assessment triggers the provision of emergency cash transfers (the SUPERATE program).

## 3.2. Priorities for decarbonization

**Without changes to the current development model and additional decarbonization measures, the DR will continue to contribute to global emissions.**<sup>125</sup> According to the projections of the CCDR MANAGE model, without decarbonization actions, emissions can be expected to increase with the growth in economic activity and the associated energy demand (figure 15).

**FIGURE 15.** Emissions path in the baseline scenario compared to real GDP



Source: World Bank staff estimates (2023).

<sup>121</sup> Lawrence Thomas Szott, German Obando, Gustavo Solano, and Rene Rivera, *Dominican Republic Forest Note: Opportunities for Employment, Tourism, and Energy* (Washington, DC: World Bank, 2020), <https://documents1.worldbank.org/curated/en/736091609910760904/pdf/Dominican-Republic-Forest-Note-Opportunities-for-Employment-Tourism-and-Energy.pdf>.

<sup>122</sup> Between 2011 and 2016, the average annual reforestation of 11,300 hectares (10.4 million trees/year) generated an average of 4,588 direct jobs per year, mainly in the form of reforestation brigades funded from the central government budget. Szott et al., *Dominican Republic Forest Note*.

<sup>123</sup> Szott et al., *Dominican Republic Forest Note*. (2020)

<sup>124</sup> SIUBEN identifies, characterizes, registers, and prioritizes families in poverty for targeted social policies.

<sup>125</sup> The baseline scenarios assume that there is a "business-as-usual" level of emissions, and therefore climate change is present. All the estimations should be interpreted as the impacts of having additional changes in temperature and precipitation.

**The Dominican Republic would gain in the short and long run from accelerating its implementation of decarbonization measures.** The main measures (detailed below) are i) shifting to a greener power mix; ii) electrification of buildings, transport, and industrial processes; iii) maintaining and enhancing the country's carbon sink through improved practices in the agriculture, forests, and land-use sectors; and iv) reducing emissions in the waste sector. In particular, decarbonization can improve the resilience of the economy and reduce energy price volatility due to fuel import dependence which, between 2021 and 2022, doubled the current account deficit to 5.5 percent of GDP, in addition to increasing inflation. Decarbonization measures can improve biodiversity and ecosystem conservation, while also reducing land and forest degradation, and air pollution.<sup>126</sup> Finally, decarbonization can help drive economic growth through DR's increased attractiveness as a sustainable tourism destination and create green jobs in the energy, transport, agriculture, tourism, and waste sectors.<sup>127</sup>

**This section explores the feasibility, costs, and benefits of pathways to reach net zero in 2050.** These are not the only pathways consistent with the Dominican Republic's long-term aspiration, and more analysis and work are needed to settle on the best possible distribution of actions across sectors, as well as preferred policies and investments.<sup>128</sup> Nevertheless, analyzing these scenarios is useful for understanding broadly the policy options, challenges, costs, and benefits.

### 3.2.1 Power: zero carbon electricity as the foundation for decarbonization

**Electricity is the largest contributor to the country's emissions, and a clean electricity grid is needed to drive emissions reduction through the electrification of buildings, transport, and industry.** Deep decarbonization of the power sector requires the scaleup and integration of renewable energy, a sustained transition from coal, aggressive energy efficiency measures, and preparation for the electrification of other sectors such as transport.

**The CCDR performed an exploratory analysis to identify policy and investment priorities to deeply decarbonize the DR's power system.** The World Bank's Electricity Planning Model—an economic optimization model for power system planning that includes capacity expansion and unit dispatch—was used to understand the implications of different levels of emission reduction for the capacity and generation mix, given assumptions about demand growth and available technologies. In contrast to the previous modeling exercises,<sup>129</sup> this analysis accounts for recent government policy trends including energy efficiency and transport electrification, that have implications for future investment needs. The analysis explores three scenarios:

- 1. The BAU scenario**, to be used as the reference, assumes no significant changes in the government's existing policies (that is, it disregards its NDC2030 goals) and assumes i) a linear electricity demand increase in line with the 2022–2036 National Energy Plan, and ii) minimal electrification of transport.
- 2. The NDC2030 scenario** assumes the incorporation of the government's committed policies and achievement of the country's NDC2030 commitments (a reduction of 3.9 Mt CO<sub>2</sub>e by 2030 compared to BAU) and the Ministry of Energy and Mines' renewable energy target (25 percent in the generation mix by 2025 and 30 percent by 2030), as well as the estimated demand growth forecast associated with having 9.3 percent of the vehicle fleet electrified by 2050.

<sup>126</sup> J. Samaniego, S. Lorenzo, E. Rondón Toro, L. Krieger Merico, J. Herrera Jiménez, P. Rouse, N. Harrison, *Nature-based solutions and carbon dioxide removal* (Santiago, Chile: ECLAC, 2023), 2023. <https://repositorio.cepal.org/server/api/core/bitstreams/18b97512-d3b7-45b2-8d03-c8741a5be9ce/content>.

<sup>127</sup> ILO and UNDP, *Evaluación Situacional Rápida sobre el potencial para la transición justa y empleos verdes en República Dominicana* (2023), <https://www.undp.org/es/dominican-republic/publicaciones/evaluacion-situacional-rapida-sobre-el-potencial-para-la-transicion-justa-y-empleos-verdes-en-republica-dominicana>.

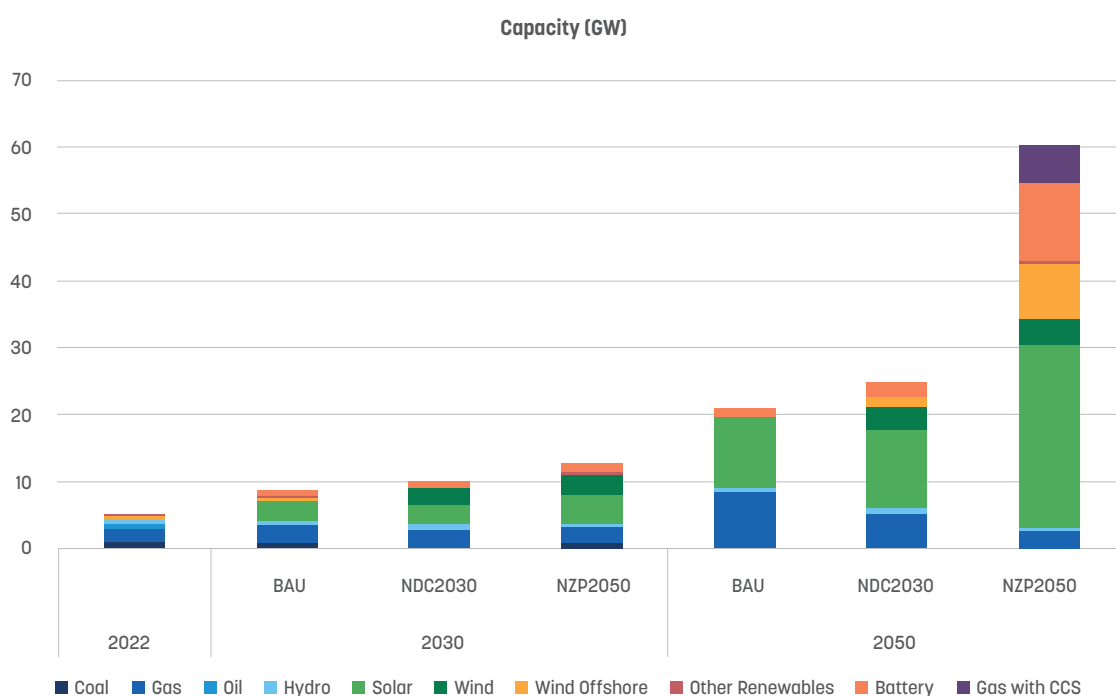
<sup>128</sup> This is work the government has started to undertake in preparation for its long-term climate strategy.

<sup>129</sup> Analyses have been performed by the National Energy Commission for the 2022–2036 National Energy Plan, and by the IDB for the recently completed *Economic Evaluation of the Decarbonization of the Electricity Sector in the Dominican Republic*. <https://publications.iadb.org/publications/spanish/document/Evaluacion-economica-de-la-descarbonizacion-del-sector-electrico-en-la-Republica-Dominicana.pdf>.

**3. The 2050 Net Zero Pathway (NZP2050) scenario** assumes a net zero emission power sector by 2050,<sup>130</sup> as well as the combined effects of ambitious energy efficiency measures and 70 percent of the vehicle fleet electrified by 2050.

**The NDC2030 and NZP2050 scenarios are both possible with the integration of renewable energy while reducing reliance on imported fossil fuels.** In the NDC2030 scenario, renewable energy needs to be complemented by battery storage; in the NZP2050 scenario, it is complemented by battery and gas with carbon capture and storage (CCS) (figure 16). New solar and wind (both onshore and offshore) investments are the cheapest way to meet new demand for energy and could meet most of the future power demand without compromising energy security. Combined solar and wind capacities can be expanded from the current 800 MW to 16,000 MW (16 GW) in NDC2030 and 40,000 MW (40 GW) in NZP2050 by 2050. To this end, investments in transmission system strengthening and battery energy storage, as well as policies to remunerate grid services, are essential. For the NDC2030 scenario, battery storage will become economically least-cost as early as 2026 and is expected to reach 1.1 GW by 2030 to meet the variable renewable energy (VRE) integration goal, provided that storage assets are adequately remunerated for providing firm capacity and flexibility. For the NZP2050 scenario, gas with CCS or gas turbines using green hydrogen<sup>131</sup> will become the optimal investments for providing firm flexible generation to support VRE integration. By 2050, the system could be powered by solar, onshore and offshore wind and hydropower, supported by battery storage, and gas with CCS to provide the system firmness, reserve, and stability. The relative role of various technologies implemented after 2030, such as green hydrogen and carbon capture, will have to be revised over time, as the costs of these technologies will continue to evolve.

**FIGURE 16.** Electricity matrix for BAU, NDC2030 and NZP2050



Source: World Bank Staff calculation using the WB's Electricity Planning Model (EPM) with further details in annex 3.

**To meet these ambitious targets, it is imperative for DR to continue to address the bottlenecks that constrain the adoption of existing technologies.** First and foremost, enhancing the sector's financial viability will be imperative for the country's sustainable energy transition. To this end, the electricity distribution segment requires deep governance reforms and improvements in operational efficiency in order

<sup>130</sup> This is in line with the government's own carbon-neutrality goal by 2050.

<sup>131</sup> Assuming green hydrogen becomes available at the landed price of US\$2-3 per kg.

to minimize energy losses, bring more revenue into the sector, and reduce the fiscal transfer requirements. More revenue into the sector would enable the distribution companies to be more financially sound off-takers to RE private developers, while allowing for investments aimed at improving service reliability and enhancing the climate resilience of the grid.

**Second, the government has improved the legal and regulatory framework for renewable energy, but more concerted effort from a range of stakeholders will be needed to ensure that system expansion and RE integration are carried out in a least-cost manner.** In November 2021, the Ministry of Energy and Mines issued a ministerial resolution to achieve 25 percent of renewable energy in the power generation mix by 2025, and 30 percent by 2030, as part of efforts to achieve the country's NDC goals.<sup>132</sup> This was followed by a February 2023 Presidential Decree<sup>133</sup> mandating competitive procurement and providing incentives for renewable energy projects. To enable VRE integration at competitive prices and attract cost-competitive independent power producers, the DR will need to i) develop a pipeline of bankable VRE projects; ii) implement efficient dispatch of gas-fired capacity to ensure flexibility and security of supply;<sup>134</sup> iii) coordinate VRE integration with transmission planning and investments to minimize constraints; iv) continue to improve the financial viability of the distribution companies to allow for the issuance of bankable power purchase agreements; v) fully implement the recently decreed competitive procurement of renewable energy projects, including consideration of the use of auctions; and vi) provide a clear framework and processes for licensing and permits, particularly for offshore wind.

**Adding substantial battery storage capacity to support VRE integration will require the right regulations and systems to be put in place on a priority basis, particularly remuneration policies (such as time-of-use tariffs) to compensate for system firmness, flexibility, and ancillary services.** Concessional financing may be needed at the initial stage to bring costs down. A working group consisting of the system operator, the unified council of the distribution companies, the regulator, and the transmission company, together with the Ministry of Energy and Mines (MEM), which has the oversight role in the sector, will be needed to align, sequence, and optimize efforts, policies, and investments.

**Third, transitioning away from coal-fired power is not only essential to achieving the government's carbon neutrality target, but also makes economic sense and will not compromise energy security.** Of the three coal-fired plants,<sup>135</sup> Itabo and Barahona are already not least-cost in any scenario with decarbonization targets (NDC2030 and NZP2050), and Punta Catalina could disappear from the least-cost mix as early as 2035 in both NDC2030 and NZP2050. The coal transition will require planning for and managing several cross-cutting issues, as well as plant-specific work. The cross-cutting issues include: i) grid impact studies of the feasible and targeted timeline for phase-down or phase-out of each of these plants; ii) studies on job profiles and identification of the potential for training and re-skilling, especially toward more renewables-oriented jobs and compensation mechanisms for the affected people; and iii) an awareness campaign to enhance public acceptance of the transition.

**Plant-specific work will include** i) identification of financial mechanisms or structuring options for the conversion and the costs of repurposing; ii) preparation of a social engagement plan and a stakeholder management plan to support the affected communities through the transition; and iii) regulatory review and actions<sup>136</sup> to outline the government's support for the conversion of the plant.<sup>137</sup> Implementing the government's plan to convert Itabo and Barahona to more efficient technologies such as gas, biomass, or

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<sup>132</sup> DR Ministry of Energy and Mines, *Resolution R-MEM-REG-029-2021*, (Santo Domingo, DR, 2021), <https://mem.gob.do/transparencia/wp-content/uploads/2021/03/R-MEM-REG-029-2021.pdf>.

<sup>133</sup> Government of the DR, *Presidential Decree No. 65-23*, Borrower's Official Gazette No. 11101 (Santo Domingo, DR, 2023), <https://www.scribd.com/document/660718947/Decreto-65-23>.

<sup>134</sup> The recent tender of gas-based capacity of 2,000 MW in total will need to be dispatched in an efficient manner to allow for future addition of VRE.

<sup>135</sup> These include Punta Catalina I and II (total 782 MW commissioned in 2019/2020, 100 percent state-owned), Itabo I and II (128 MW and 132 MW commissioned in 1984 and 1988, respectively, with 50 ownership split between the government and Grupo Linda), and Barahona (45.6 MW commissioned in 2001 and modernized and expanded to 52 MW in 2018 with 50 percent ownership by the government and Empresa Generadora Haina (EGE Haina) each). With no domestic coal production, the companies import coal from neighboring countries and are therefore vulnerable to price volatility and stock availability.

<sup>136</sup> Fully owned by the state, the functioning and operation of Punta Catalina is governed by ministerial or presidential decrees.

<sup>137</sup> The work is ongoing with the view to submitting an investment plan to the Climate Investment Funds by mid-2024.

renewables will require thorough considerations of the technical, financial, and socio-economic aspects.<sup>138</sup> The MEM will be responsible for coordinating the government's efforts, in close coordination with the National Energy Commission, the Superintendence of Electricity, the Ministry of Environment, the NCCC and other relevant stakeholders.

**Deep decarbonization in the power sector, while catering to the transport sector's rising demand for electricity, would push the total discounted system costs to US\$34.7 billion for NDC2030 and US\$51.0 billion for NZP2050.** Accordingly, it would require investments in net present value of US\$12.0 billion for the NDC2030 and US\$25.5 billion for the NZP2050. Decreasing the additional investments of NZP2050 and NDC2030 would require a more coordinated charging of EVs throughout the day making use of domestic RE resources through policies and incentives such as peak and off-peak pricing, roll-out of public charging stations, and on-site charging infrastructure for "carga" vehicles.

### 3.2.2. Energy use in buildings: new standards and retrofits

**Energy-efficient buildings and sustainable cooling systems will lower energy costs, enhance health, and create local jobs, in addition to reducing the carbon intensity of the energy system.** Most of the energy consumed in residential, commercial, and public buildings is for cooling and lighting. Improving the efficiency of air conditioning and of lighting has the highest emission reduction potential among energy efficiency measures.<sup>139</sup> It is estimated that improvements in the two would reduce up to 3.11 Mt CO<sub>2</sub> by 2030 and 30.70 Mt CO<sub>2</sub> by 2050. Specific mechanisms include the introduction of better energy efficiency standards governing equipment, enforcement of energy efficiency standards for new construction and renovations, implementation of energy management systems in both public and private sectors, and the creation and strengthening of a market for energy efficiency services, including through capacity building activities.<sup>140</sup> A draft law on energy efficiency, which is currently under review and will require the approval of Congress, will provide a strong legal framework and basis for public and private energy efficiency initiatives and investments in efficient equipment, vehicles, and buildings.<sup>141</sup> For the commercial and industrial sector, which is dominated by cement and ceramics, sugar and non-sugar foods, and hotels, there are efficiency gains to be made in roof and exterior wall insulation, glass efficiency for windows, and efficient lighting at the construction stage.<sup>142</sup>

**The public sector has the potential to lead energy efficiency initiatives as a major energy consumer.** An April 2023 Presidential Decree<sup>143</sup> requires the use of energy-efficient technologies, consumption habits, and investments in alternatives to fossil fuels by public institutions, including autonomous and decentralized entities. Through public sector programs led by MEM, the public sector can create markets for providers of energy efficiency equipment and services, which will facilitate the establishment of local value chains and the human resource capacity to address efficiency challenges. If implemented well, these programs will provide significant demonstration effects and raise awareness for businesses and households, making them more likely to also invest in energy efficiency measures. To design and successfully implement these programs,

<sup>138</sup> In April 2023, the government received an invitation from the Climate Investment Funds to prepare an Investment Plan for US\$85 million of concessional funding from the CIF's Accelerating Coal Transition (ACT) window to explore the potential for, and financing of the conversion of these coal plants.

<sup>139</sup> World Bank, *Marginal Abatement Cost Curves in the Electricity Generation, Energy Efficiency and Road Transport Subsectors* (Washington, DC: World Bank, September 2021). Internal document.

<sup>140</sup> The DR has been increasingly promoting green building certification, through standards such as LEED and EDGE (promulgated by the IFC). The country currently has six LEED certified buildings, of which two are Platinum, one is gold and two are silver. See Green Building Information Gateway, LEED Platinum Projects (2022), <https://www.gbig.org/collections/9495>.

<sup>141</sup> The World Bank has been providing technical assistance on identifying the regulatory gaps and investment potential for sustainable cooling and energy efficiency in buildings (under the Operationalizing Energy Efficiency and HFC Phase-Down Synergies ASA-P174396), as well as on the preparation of a national energy efficiency strategy as part of its support to the ongoing Energy DPL series.

<sup>142</sup> World Bank, *Country Private Sector Diagnostic. Creating Markets in the Dominican Republic. Investment opportunities and growth pathways to higher value addition, resilience, and inclusion* (Washington, DC, 2023), <https://www.ifc.org/content/dam/ifc/doc/2023/dominican-republic-country-private-sector-diagnostic-en.pdf>.

<sup>143</sup> Government of the DR, *Presidential Decree No. 158-23* (Santo Domingo, DR, 2023), <https://presidencia.gob.do/decretos/158-23>.

there need to be energy audits, programs for replacing outdated and inefficient equipment, adoption of energy-efficient consumption habits, and consideration of and investment in alternatives to fossil fuels for cooling and heating public buildings.<sup>144</sup>

### 3.2.3. Low-carbon transport sector

**A high rate of motorization in the DR in the last decade has led to congestion, high emissions, and traffic accidents.** Passenger cars are the main contributor to GHG emissions in the transport sector (48 percent), followed by light commercial vehicles (34 percent), buses (7 percent), trucks (5 percent), and motorcycles (5 percent). In the last 10 years, the national vehicle fleet has increased by an annual average of six percent and the motorization rate has doubled to over 350 vehicles per 1,000 people. The fleet is old, with 53 percent of all registered vehicles manufactured prior to 2000.<sup>145</sup> The advanced age of the urban fleet intensifies congestion because of frequent breakdowns or particularly slow-moving vehicles, aggravates pollution, and increases operational costs for operators.<sup>146</sup> "Conchos" (self-organized public transport operators) play a significant role in the public transport system and contribute to significant congestion given the high level of informality and the amount of units operating (16,000 units in San Domingo, compared to the 100 formal buses).<sup>147</sup> The widespread use of motorcycles, inadequate infrastructure, and unsafe vehicles all contribute to road safety issues.<sup>148</sup> Modal shifts as well as electrification and improvements in vehicle efficiency should be central elements of an integrated transport policy to decarbonize the sector.

**A modal shift to public transport<sup>149</sup> will address several of the above challenges but will require further government action and public sector-led financing.** Investments to expand the Santo Domingo Metro, the new cable car line in Santo Domingo, and the creation and adaptation of the bus rapid transit system in Santo Domingo and Santiago de los Caballeros by 2030<sup>150</sup> will require some US\$2.5 billion and have the potential to reduce emissions by 5,000 of billion Mt of CO<sub>2</sub>e per year. Other priorities include the creation of express bus lanes for larger cities, implementation of an integrated fare system for buses and metro, enhancement of feeder bus services, enforcement of traffic demand management/congestion pricing to deter private car usage, and adaptation of the road network for bicycle lanes. Although the majority of new investments in public transit are funded from public trust funds,<sup>151</sup> the execution of these investments will need to be complemented by the establishment of clear institutional roles, including, for example, through the empowerment of INTRANT and the enhancement of planning and implementation capacity.

<sup>144</sup> Some of which the government has already commenced (see section 2.3).

<sup>145</sup> J. Del Rosario, *Transporte público y movilidad urbana en el GSD: desafíos de una política social para la inclusión y equidad*. (Santo Domingo, DR: Observatorio de políticas sociales y desarrollo, Vicepresidencia de la República, 2016), <https://www.researchgate.net/publication/320068259>.

<sup>146</sup> World Bank, *Dominican Republic Infrastructure Sector Assessment Program (InfraSAP)* (Washington, DC: World Bank, 2020), <https://thedocs.worldbank.org/en/doc/96550c14d62154355b6edc367d4d7f33-0080012021/original/Infrastructure-Governance-Assessment-Framework-December-2020.pdf>.

<sup>147</sup> There are approximately 16,000 *conchos* operating in Santo Domingo, compared to 3,000 minibuses or microbuses and 100 buses. See annex 4 for details.

<sup>148</sup> In 2016, the country had a traffic-related mortality rate of 34.6 deaths per 100,000 inhabitants, equivalent to an annual average of 3,118 deaths, which is significantly higher than both the global (18.2) and regional (15.6) averages. OMS, *Informe sobre la Situación Mundial de la Seguridad Vial* (2016), [https://www3.paho.org/hq/index.php?option=com\\_content&view=article&id=12316:report-road-safety-in-the-americas&Itemid=0&lang=es#gsc.tab=0](https://www3.paho.org/hq/index.php?option=com_content&view=article&id=12316:report-road-safety-in-the-americas&Itemid=0&lang=es#gsc.tab=0).

<sup>149</sup> Modal shifts refer to the transition from the prevalent use of personal vehicles to public transit, and freight transport to more energy-efficient modes such as rail and waterways. Emission-based (truck) tolling can be an effective way to decarbonize the freight sector. Further studies will be required to better understand the economic opportunities in the case of the DR.

<sup>150</sup> In Santo Domingo, the Sustainable Urban Mobility Plan supports a modal shift to mass transit, with a focus on reducing emissions by about 50 percent by 2050. See Mobilize Your City, UNFCCC, and Intrans, *Plan de Movilidad Urbana Sostenible del Gran Santo Domingo* (2019), <https://www.mobilisyourcity.net/sites/default/files/2020-01/PMUS%20Gran%20Santo%20Domingo.pdf>.

<sup>151</sup> A significant example of such a trust fund is *Fideicomiso para el Desarrollo de Transporte Masivo* (FITRAM). Managed by the Office of the Presidency, it was established to finance the construction of the metropolitan train system in Santo Domingo and the monorail in Santiago de los Caballeros. Other trust funds include RD Vial, Parquet RD (under the Ministry of Public Works and Communications), and *Fideicomiso Movilidad y Transporte* (FIMOVID), regulated by INTRANT, the regulator of public transport. In 2021, 53 percent of investments were financed through external credit, primarily from the French Development Agency (AFD) and IDB. Operational expenses are covered by tariff revenues and public subsidies to address the operational deficits of state-owned companies.

**Electrification of public buses and private cars has benefited from an improved legal and regulatory framework,<sup>152</sup> but further incentives and clearer rules are needed.** The 2020 National Strategic Plan for Electric Mobility<sup>153</sup> envisaged that electric vehicles (EVs) would make up 8 percent of the total fleet by 2030 and 46 percent by 2050. INTRANT is considering including EVs in renewing its public transport fleet and is analyzing the financing options through *Fideicomiso Movilidad y Transporte* (FIMOVIT).<sup>154</sup> In early 2023, the *Superintendencia de Electricidad* (SIE) issued two regulations on technical standards<sup>155</sup> and tariffs<sup>156</sup> to incentivize investments in charging stations. A modification to Law 103-13 on incentives for the importation of non-conventional (electric) vehicles was also submitted to Congress in May 2023. The following actions will need to be taken to unlock financing for EVs and ensure the sustainability of adoption and scale-up i) electricity distribution companies institute hourly tariffs at charging stations to optimize charging time and minimize impacts on the grid; ii) government and investors jointly evaluate the adequacy of the regulatory framework for e-bus acquisition, as well as EV charging infrastructure; iii) develop PPP schemes and business models for fleet renewal and upgrades, including concho fleets (see next paragraph); iv) proactively implement battery recycling and waste management programs; and v) empower INTRANT to coordinate the implementation of the 2020 Strategy in close coordination with the Office of Mobility Projects under the Ministry of the Presidency, the Ministry of Energy and Mines, SIE, the Ministry of Environment and Natural Resources, and other relevant stakeholders.<sup>157</sup>

**Beyond electrification, standards need to be enforced to improve the efficiency of vehicle fleets — especially conchos.** The transformation of informal conchos into bus companies assigned to specific corridors has been a priority for INTRANT and is well underway. However, this also needs to be accompanied by a comprehensive program that includes i) technical inspection of all vehicles in circulation; ii) setting and adopting a renewal policy that encourages concho (and taxi) owners and operators to replace them with electric and hybrid units; and iii) scrapping or recycling old vehicles and enforcing road-worthiness standards to reduce emissions and improve road safety.

### 3.2.4. Sustainable landscape management and conservation of forests

**Forest cover in the Dominican Republic has increased in recent decades.** Since the mid-1960s, when forests covered less than 12 percent of the country, forest cover has increased to 46 percent (2.1 million hectares) as of 2015. This net increase in forest cover differentiates the DR from most other countries in the region where forest loss persists. Several factors have contributed to forest recovery, including the DR's comprehensive environmental and forest legal framework, the enforcement of restrictions on timber harvests from natural forests, the establishment of the National System of Protected Areas (SINAP), and the implementation of government-sponsored reforestation programs.<sup>158</sup>

**Deforestation and forest degradation remain important challenges despite the net increase in forest cover.** Between 2005–2015, forest cover expanded by 244,000 hectares, equivalent to a net growth of 13 percent, despite significant deforestation. Continuing deforestation and forest degradation have resulted in the expansion of areas of young forest at the expense of primary or mature forests: most of the country's forests, about 1.6 million hectares, are secondary or degraded forests. The tendency toward younger forests has implications for biodiversity and the provision of ecosystem services and livelihoods, because forest loss tends to be concentrated in areas that contain a high proportion of primary forests, protected natural areas,

<sup>152</sup> Government of the Dominican Republic, *Law of Incentives to Electric Mobility (103-13)* (Santo Domingo, DR: 2013), <https://do.vlex.com/vid/ley-n-103-13-840905434>.

<sup>153</sup> F. Anaya, *Plan Estratégico Nacional de Movilidad Eléctrica de República Dominicana*. (Santo Domingo, DR: Instituto Nacional de Tránsito y Transporte Terrestre – INTRANT, 2020), <https://mem.gob.do/wp-content/uploads/documentos-transicion/11.%20Plan%20Estrategico%20Nacional%20de%20Movilidad%20Electrica%20%202020.pdf>.

<sup>154</sup> FIMOVIT provides a financing structure that enables increased investment capacity, utilizing trusts from private transport companies that comply with INTRANT's established regulations in conjunction with resources from multilateral development banks and green funds, among others.

<sup>155</sup> Superintendencia de Electricidad, *Regulation No. SIE-137-2022-REG*, (Santo Domingo, DR, 2022), <https://sie.gob.do/wp-content/uploads/2022/12/SIE-137-2022-REG-Regl.-Tecnico-Est.-Recarga-Veh.-Electrico-ANEXO.pdf>.

<sup>156</sup> Superintendencia de Electricidad, *Regulation No. SIE-138-2022-REG*, (Santo Domingo, DR, 2022), <https://sie.gob.do/wp-content/uploads/2022/12/SIE-138-2022-REG-Regl.-TF-Est.-Recarga-Veh.-Electrico-ANEXO.pdf>.

<sup>157</sup> World Bank, *Dominican Republic Infrastructure Sector Assessment Program*.

<sup>158</sup> Szott et al., *Dominican Republic Forest Note*.



and high poverty rates. Direct drivers of deforestation include the conversion of forest land into other uses – for example, the conversion of hillside forests to pastures for livestock or cropland, the impact of tourism on mangroves and recent suburbanization of rural landscapes. Forest degradation is caused mainly by the cross-border trade in firewood and charcoal. Although domestic consumption of charcoal has decreased over the last 20 years because of the substitution of liquified petroleum gas, significant demand from Haiti has generated informal trade in provinces near the border.<sup>159</sup>

**Forests play a prime role in reducing GHG emissions and achieving the country's climate commitments.**

Land represents a sink of 10.85 Mt CO<sub>2</sub>e (on gross emissions of 35.49 Mt CO<sub>2</sub>e). The country's updated NDC proposes mitigation measures in the forestry sector such as the conservation and restoration of mangroves. The goal is to increase the reforestation rate from 11,300 to 15,000 ha/year through the national program and public-private partnerships, implementing the REDD+ program and establishing silvopastoral systems. These measures are central to achieving the mitigation targets established in the NDC, as well as the country's vision of achieving net zero emissions by 2050.

**The continuing implementation of the REDD+ program is essential to climate change mitigation and the contribution of forests to the country's development.**

The REDD+ program seeks to both reduce GHG emissions and strengthen the legal and institutional framework for land use management. The estimated total cost of the program is US\$153.8 million, to be financed by the government, contributions from international cooperation, and investments from the private sector. The REDD+ program promotes sustainable productive systems based on agroforestry and natural resource management, including the incorporation of agroforestry for better management of agricultural and cattle farms, silvopastoral systems, and the design and implementation of sustainable production in buffer zones around designated protected areas.

**Climate-smart livestock measures could also help mitigation efforts while generating adaptation co-benefits.**

Livestock farming is the main source of emissions in the agriculture sector and have permanently replaced forest cover in much of the country. In high and middle river basins, livestock farming occupies most of the surface area of hillside land, and around 180,000 hectares of pastureland are in protected areas.<sup>160</sup> Government programs for agriculture, livestock, and forestry still lack an aligned policy framework that supports forest conservation. This results in limited interinstitutional coordination at both the local and national levels. Measures to reduce the impact of livestock on emissions could build on project experiences, such as the GanaClimaRD, which was implemented between 2019 and 2022 on 30 small and medium-sized farms within the Yuna river basin encompassing 27 municipalities, nine provinces, and 6000 hectares.<sup>161</sup> In addition, the DR is also undertaking efforts to reduce emissions from livestock while fostering resilient and regenerative agriculture. The DR Livestock Protocol Project aims at reducing GHG emissions through the installation of biogas control systems on dairy, beef, chicken, and swine farms. The main focus of the protocol is the quantification of methane emissions from manure, but it also accounts for CO<sub>2</sub> emissions.<sup>162</sup>

**Changes in incentives and investments in innovations that lead to both productivity enhancements and GHG emissions reductions could be explored.**

The Dominican Republic's public support for the agriculture sector represented 1.12 of the country's GDP in 2019.<sup>163</sup> Concerted efforts to repurpose a portion of government spending on agriculture each year to develop and disseminate more emission-efficient technologies for crops and livestock could potentially deliver substantial gains. Although analysis is needed at the national level to understand how government expenditure in agriculture impacts climate change,

<sup>159</sup> Szott et al., *Dominican Republic Forest Note*.

<sup>160</sup> Forest Carbon Partnership, *Dominican Republic Emission Reductions Program Document (ER-PD)* (2019), <https://www.forestcarbonpartnership.org/country/dominican-republic>.

<sup>161</sup> The project has resulted in a 38 percent increase in pasture and forage productivity, a 35percent increase in milk production per farm, and a 38 percent increase in beef production. In terms of emissions reduction, the data shows a decrease of 11 percent of GHG emissions per farm and 22 percent per milk liter (~7,700 t CO<sub>2</sub>e). FAO, *Promoviendo la ganadería climáticamente inteligente en República Dominicana, GANA CLIMARD: Informe Final*. (Rome: FAO, 2022), <https://ganaderiayclimard.do/ganaclima>.

<sup>162</sup> Climate Action Reserve, *Dominican Republic Livestock Protocol v. 1.0* (2023), <https://www.climateactionreserve.org/es/how/protocols/waste/dominican-republic-livestock>.

<sup>163</sup> IDB, *Agrimonitor: Dominican Republic* (Washington, DC: Inter-American Development Bank, n.d), <https://agrimonitor.iadb.org/en/country-results?country=do&tab=agriculture>.

and what the potential benefits of repurposing might be, global-level analysis suggests that repurposing could result in higher incomes for farmers, increased emissions reductions, and productivity growth while releasing agricultural land for restoration to natural habitats and reducing poverty.<sup>164</sup>

### 3.2.5. Waste

**High rates of waste production, improper waste disposal, and low rates of recycling are pressing problems throughout the country.** The DR produces more than 4 million tons of solid waste annually, equivalent to 1.11 kilograms of garbage per person per day, above the regional average.<sup>165</sup> There are more than 300 municipal landfills which generally lack adequate management systems, are a source of pollution and GHG emissions, and generate health risks for those who work in them or live close by. It is estimated that only around 6 percent of the total solid waste generated is recovered for recycling.<sup>166</sup> In addition, there is limited technical and financial capacity at the national and municipal levels to monitor and assess the effectiveness of the waste management system. The waste sector is the second-largest source of emissions in DR, contributing 16 percent of the total GHG emissions (chapter 1). Organic waste is a large component (60 percent) of the solid waste profile in the DR and a key contributor to emissions from the sector.<sup>167</sup> The improper handling of solid waste also limits the possibilities of generating value from waste, especially organic waste, which could be used for energy generation.

**The DR has strengthened its legal framework for integrated solid waste management and reduced emissions.** Law 225-20 on Integrated Solid Waste Management and Co-Processing promotes the reduction, reuse, and recycling of waste recovery. Two recent resolutions also support the country's efforts to decrease waste emissions: Resolution 36/2021 to regulate and decrease emissions in around 243 open-air landfills; and Resolution 31/2022 which defines the technical guidelines for the functioning and operation of the Trust for the Integral Management of Solid Waste mandated in Law 225-20.

**Measures to reduce emissions from waste include integral waste management that follows the principles of the circular economy and sustainability.** Investments in better waste management and circular economy initiatives, and promoting green technologies and enterprises that create new products and services to reduce waste, are important entry points for the creation of green jobs<sup>168</sup>. Measures proposed in the updated NDC are significant steps in this direction and include the development of a national strategy on organic waste to reduce methane emissions, the use and capture of methane in landfills for energy production, and the integration of circular economy processes in the sector.<sup>169</sup> Currently, the DR generates a substantial 67,000 tons of e-waste annually.<sup>170</sup> Transitioning to a circular economy in the electronics sector is needed to mitigate the sector's environmental impacts, generate energy savings, and promote resource-efficient practices within the sector. This will be increasingly important as the digital economy expands and demand for electronic devices rises.

<sup>164</sup> M. Gautam, D. Laborde, A. Mamun, W. Martin, V. Piñero, and R. Vos, *Repurposing Agricultural Policies and Support: Options to Transform Agriculture and Food Systems to Better Serve the Health of People, Economies, and the Planet* (Washington, DC: World Bank and International Food Policy Research Institute (IFPRI), 2022), <https://openknowledge.worldbank.org/server/api/core/bitstreams/9b868e1d-ad84-5229-a0df-12b541e848b/content>.

<sup>165</sup> World Bank, *Paving the way for prosperous cities and territories*.

<sup>166</sup> Judith Wolf, *Situación Actual de Gestión de Residuos en República Dominicana* (Germany: Deutsche Gesellschaft für Internationale Zusammenarbeit (GIZ), 2018), <https://cambioclimatico.gob.do/phocadownload/Documentos/giz/Wolf,%20Judith%20-%20Informe%20Final,%20Estado%20GIRS%20Rep.Dom.%20Nov.%202018.pdf>.

<sup>167</sup> E. Franco, W. Padrón Iglesia, and K. Pérez Teruel, *Household Solid Waste Management in the Dominican Republic: Case of the Municipality of Puñal*, *Santiago, Sustainability* 14, no. 6 (2022), <https://doi.org/10.3390/su14063149.9>

<sup>168</sup> International Labor Organization (ILO) and UNDP, *Rapid Situational Assessment on the potential for just transition and green jobs in Dominican Republic* (2023), <https://www.undp.org/es/dominican-republic/publicaciones/evaluacion-situacional-rapida-sobre-el-potencial-para-la-transicion-justa-y-empleos-verdes-en-republica-dominicana>.

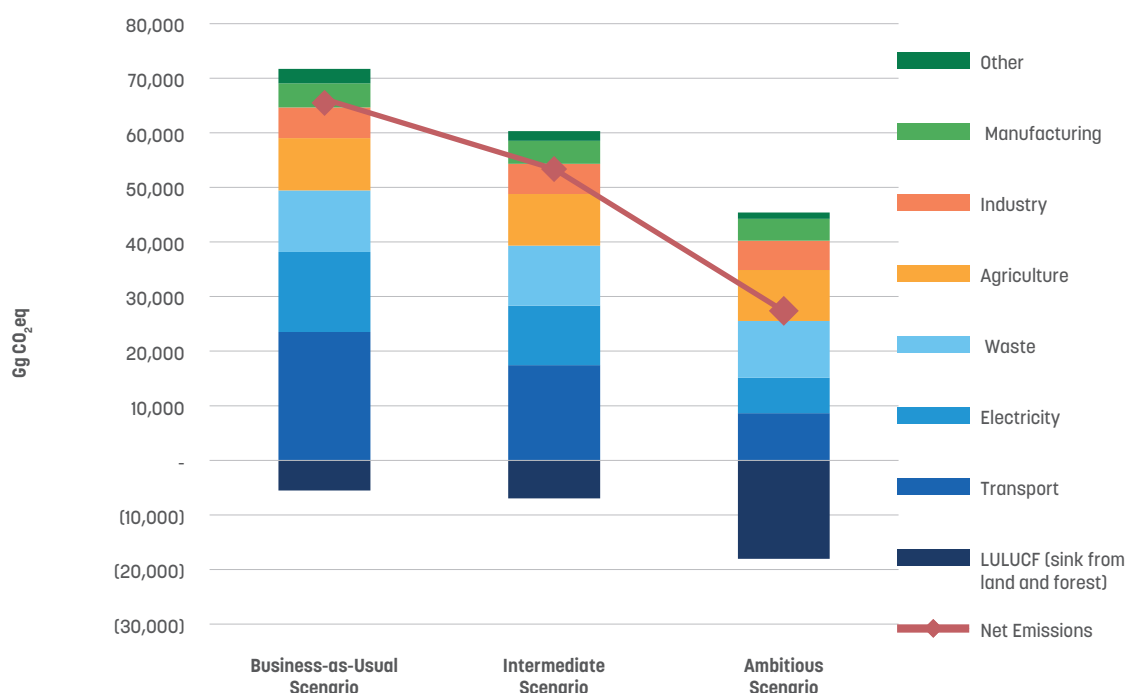
<sup>169</sup> The DR is gradually closing the Duquesa Landfill (Resolution No. 012/2018). As of 2019, Duquesa receives 4,000 tons/day of waste and is considered one of the biggest landfills in the Caribbean. As part of this process, a recent IADB study assessed the potential for a biogas production project. It shows that a reduction of around 2,149,128 of CO<sub>2</sub>e could be achieved in 13 years with the implementation of the project from 2024 to 2037. See IADB, *Modelo de Biogás, Estudio de Factibilidad del Proyecto de Aprovechamiento de Biogás en Vertedero Duquesa, Santo Domingo* (2022).

<sup>170</sup> V. Forti, C. Baldé, R. Kuehr, and G. Bel, *The Global E-waste Monitor 2020: Quantities, flows and the circular economy potential* (Bonn/ Geneva/Rotterdam: United Nations University, United Nations Institute for Training and Research, International Telecommunication Union, and International Solid Waste Association), [https://www.itu.int/mcas.ms/en/ITU-D/Environment/Documents/Toolbox/GEM\\_2020\\_def.pdf?McasTsid=20893&McasCtx=4.4](https://www.itu.int/mcas.ms/en/ITU-D/Environment/Documents/Toolbox/GEM_2020_def.pdf?McasTsid=20893&McasCtx=4.4)

### 3.2.6. A pathway to net zero 2050

The scenarios described above would result in significant decarbonization but would not attain net zero by 2050. Even after undertaking ambitious sectoral reforms,<sup>171</sup> modeling suggests that total emissions in 2050 will still be 27.36 Mt CO<sub>2</sub>e (figure 17). To achieve its aspiration of climate neutrality by 2050, the DR will need to adopt even more ambitious sectoral reforms and combine these with economy-wide measures (for example, the pricing of carbon). In particular, additional measures in agriculture and waste will need to be considered. Future decreases in the costs of green technologies, along additional policy actions, could also speed up the decarbonization.

FIGURE 17. Decarbonization by sector<sup>172</sup>



Source: World Bank staff elaboration using MANAGE model (2023).

## 3.3. Costs and investments for resilient and low-carbon development

**Investments in a resilient, low-carbon development path, although costly upfront, bring broad benefits in terms of reduced emissions, less fuel use, fewer traffic accidents, and increased resilience.** In an ambitious scenario (table 1), new power infrastructure will require significant upfront investments—1.1 percent of cumulative GDP by 2050. Power sector mitigation efforts are an important investment to support the achievement of country commitments on climate change and offer the greatest mitigation impacts. They also enable deep electrification of the transport sector. Transport decarbonization investment costs are estimated at 1.1 percent of cumulative real GDP by 2050, including HEVs, BEVs, and modal shift. While both investments are costly, their long-term economic benefits jointly outweigh their costs as a result of avoided emissions, reduced fuel costs and road damage, and reductions in deaths from improved air quality. Moreover, there are opportunities for private sector mobilization to support a share of these investments for both sectors, and future technological developments are likely to result in further declines in costs to make this transition sustainable.

<sup>171</sup> The ambitious scenario includes Transport (ZE2050ELEFF) and Energy (NZE2050), and Carbon sink (NZE2050). The intermediate scenario includes Transport (ZE2050EF) and Energy (Intermediate scenario with additional electrification), and the Carbon sink (NDC2030). See annexes 3 and 4 for the energy and transport scenarios.

<sup>172</sup> Emissions in a billion metric ton (Mt) CO<sub>2</sub>e.

**In the land and forest sector, investments in improving the land sink offer sizeable benefits to mitigation and provide net positive total additional benefits in terms of increased income and reduced fuel use as well as benefits to resilience.** By 2050, investments in mitigation in land and forests will cost 0.02 percent of cumulative GDP, and will provide relatively large emissions reductions both by 2030 and by 2050. They are relatively less costly per ton of GHG emissions achieved than reductions in the power and transport sector are, although there is a need for strong MRV to ensure that reductions are directly attributable to the investments and are therefore additional. These interventions will also generate positive small net economic co-benefits by improving agricultural income and reducing fuel usage in production systems (0.1 percent of GDP by 2050). Improvements to the carbon sink could additionally improve water cycle regulation and water quality, reduce erosion and flood impacts, and provide significant biodiversity benefits. AFOLU mitigation costs are derived from analysis conducted for the development of a potential future Low-Carbon and Resilient Development Strategy. They are based on existing and planned priorities for implementation of the NDC, and assume continuation of similar costs and benefits out to 2050. AFOLU investments are focused more on 2030, with continuation of current programs out to 2050 assuming similar costs and benefits.

**TABLE 1.** Additional Investment Needs for Resilient, Low-Carbon Development

	Accumulated Emissions Reductions (MtCO <sub>2</sub> e)		Investment Costs (% Cumulative GDP)		Investment Costs (Million 2022 USD)		Total Benefits (% Cum. GDP)		Net Benefits (% Cum. GDP)	
	By 2030	By 2050	By 2030	By 2050	By 2030	By 2050	By 2030	By 2050	By 2030	By 2050
Combined Power/Transport	14	221	1.0%	2.2%	7,660	38,037	0.4%	2.3%	-0.6%	0.1%
Power	10	207	0.3%	1.1%	5,221	18,399	0.2%	0.9%	-0.1%	-0.2%
Transport	4	14	0.7%	1.1%	2,439	19,638	0.2%	1.3%	-0.5%	0.3%
AFOLU <sup>^</sup>	23	57	0.0%	0.0%	215	417	0.1%	0.1%	0.1%	0.1%
Tropical cyclone/SLR	-	-	1.5%	1.6%	11,689	2,3980	2.1%	5.0%	1.4%	3.4%

\* Gross investment needs estimated with a 6 percent discount rate. <sup>^</sup>Agriculture investments total \$291 million in 2030 and \$658 million by 2050 but are not explicitly incorporated into the macro model. Benefits monetized include avoided emissions, avoided fuel use, and for transport and power, reduced mortality from improved air pollution, fewer accidents, and less road damage for transport. For AFOLU, the benefit relative to other land uses is used for net benefit.

Source: World Bank staff elaboration (2023).

**Investments in resilience can provide substantial economic benefits and complement the transition to a low-carbon growth path.** The greatest investment needs in this analysis are identified in addressing sea-level rise, coastal flooding, and cyclone damage, followed by adaptations to address heat stress, and then crop production and water storage needs. Combined, these investments in total require an outlay of at least 1.6 percent of cumulative GDP by 2050. However, they bring significant benefits associated not only with the direct reduction in damage —equivalent to 3.4 percent of cumulative GDP— but also with economic multiplier effects, along with wider social and economic benefits, not all of which are quantifiable in the context of the DR.

**Studies in other contexts have identified economic productivity and entrepreneurship benefits to investments in reducing disasters.**<sup>173</sup> Modeling results estimate that efforts to reduce heat stress exposure —in addition to reducing productivity losses by 50 percent in the service sector and 50 percent in industry annually by 2050— could have major impacts on health and energy use that could be particularly beneficial to disadvantaged communities.<sup>174</sup> Crop resilience investments result in absolute gains to agricultural productivity in the short term (by 2030), and near-complete amelioration of climate impacts out to 2050, with a 97 percent reduction in yield losses. Some of these measures may have co-benefits for improving carbon storage and enhancing the land use sink. For example, adoption of conservation tillage and reductions

<sup>173</sup> C. J. Boudreaux, M. P. Escaleras, and M. Skidmore, *Natural Disasters and Entrepreneurship Activity*, *Economics Letters* 182, no. 1 (2019), doi:10.1016/j.econlet.2019.06.010.

<sup>174</sup> Greg Kats and Keith Glassbrook, *Delivering Urban Resilience* (Washington, DC: Capital-E, 2018), <https://smartsurfacescoalition.org/analysis/delivering-urban-resilience-full-report>.

in erosion can maintain and enhance carbon sequestration in soil.<sup>175</sup> Unmet demand for municipal and industrial water also declines by 12.3 percent annually by 2030, declining to a 7.7 percent reduction in annual losses by 2050 as climate impacts accelerate. Greater water efficiency could enhance economic activity, reduce erosion, and improve soil quality.<sup>176</sup>

**These estimations are subject to high uncertainty and do not cover the full range of possible investments.** A wide range of hazards and investments were not included in this analysis because of lack of data, and there are others that were not modeled here but have been modeled by other researchers, who have found a wide range of impacts. For example, for inland flooding, where global analysis has found that the net present value of costs for inland flooding risk reduction has an interquartile range (IQR) between US\$0.2 and US\$4.9 billion (median US\$1.1 billion) with the NPV of annual expected avoided losses between US\$0.3 and US\$13.8 billion (median US\$2.2 billion) by 2050, demonstrating the high level of uncertainty surrounding the potential scale of needed investments.

**The adaptation cost analysis above suggests the central importance of future analyses to support resilience investments.** Specifically, the costing of nature-based solutions to address coastal hazards and sea-level rise could be deployed in support of the priorities identified in the 2020–2025 climate action plan and to achieve the recommended actions for AFOLU mitigation through mangrove restoration. Additional efforts to understand the opportunities for gray and green infrastructure solutions to urban flooding could also help address adaptation needs. Comprehensive analysis of the infrastructure investments needed to provide resilient public services could also deepen understanding of the range and magnitude of investments needed for climate change adaptation. Since many of these policies will have substantial distributional impacts, full distributional analyses should also be conducted to ensure that policies address concerns of equity and fairness.

**The Dominican Republic has taken important first steps to track public expenditures that have climate impacts.** For the first time, the 2023 budget tags climate-related spending, including expenditures that have both a positive and negative impact on climate change. The tagged spending covers core national government agencies but not yet state-owned enterprises or subnational governments. In 2023, expenditures aimed at towards climate change-inducing activities (US\$1.35 billion) were 1.8 times more than climate-friendly spending (US\$760 million).<sup>177</sup> These current expenditures can be compared to the investment needs estimated in the CCDR to understand the scale of these investments relative to current spending. Annual discounted investments in resilient low-carbon development would average 4.7 percent of annual GDP every year from 2023 to 2050 —approximately US\$6.7 billion (in 2022 dollars) per year assuming full public financing. This is about 8 times larger than the current public budget allocation for positive climate action and would likely require substantial public sector financing and efforts to mobilize private sources of capital. The scale of these investments is significantly larger than current negative climate finance in the public budget and illustrates the importance of identifying sustainable approaches to financing future investments because simply reallocating current negative expenditures is insufficient for the scale of needed investment.

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<sup>175</sup> S. Hussain et al., *Carbon Sequestration to Avoid Soil Degradation* (Basel, 2001), <https://pubmed.ncbi.nlm.nih.gov/34685810/>; J. Quinton et al., *The Impact of Agricultural Soil Erosion on Biogeochemical Cycling* (2010), <https://www.nature.com/articles/ngeo838>.

<sup>176</sup> Helen Ding, Tian Yu, Wenyi Xi, Lu Lu, Wee Kean Fong, Yin Cao, Shuya Kuang, et al., *Accelerating Climate-Resilient Infrastructure Investment in China* (Washington, DC: World Resources Institute, 2021), <https://wri.org/en/research/accelerating-climate-resilient-infrastructure-investment-china>.

<sup>177</sup> See annex 5 for the full table and an elaboration.

## 4. Macroeconomic Implications of Climate Change

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### Main Messages

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- Achieving the Dominican Republic's development and climate vision will require the economy to be more resilient and productive. Sector-specific measures to achieve decarbonization in energy, transport, agriculture and land use, water and other sectors will need to be complemented with economy-wide action to incentivize a more sustainable and resilient growth model.
  - Given the country's limited fiscal space, the transition to a more resilient, low-carbon economy will require restoring fiscal buffers and mobilizing additional tax revenues, including increasing carbon taxes, reassessing the current tax structure, and reducing subsidies. In the short term, this will involve difficult choices and careful sequencing of policy actions.
  - Financial market development would enable the private sector to play a more active role, but a more effective and efficient public sector is critical to reorienting economic behavior and incentives toward more climate-friendly actions.
  - To address the challenges posed by climate change, it will be necessary to implement strategies that promote productivity growth and expand the range and diversity of exported goods. Also crucial will be programs aimed at retraining workers, and at offsetting the impact of some of the necessary adjustments on lower-income households.
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**The Dominican Republic's 2030 National Development Strategy offers an ambitious vision for the country, putting development and climate at the center.** It details the pathway to creating a society with sustainable production and consumption, and addresses important aspects of managing risks and protecting the environment and natural resources, while ensuring equity and efficiency. The strategy also emphasizes the need for adequate adaptation to climate change and for the provision of essential services such as education, health, decent housing, and good-quality basic services for the entire population. The DR has included in its updated NDC an intention to achieve carbon neutrality by 2050 and, to that end, will develop a Low-Carbon and Resilient Development Strategy.

**To achieve these objectives, the country will have to navigate two climate-related transitions, each of which will have substantial macroeconomic effects.** First, a structural transition of the economy from positive emissions to carbon neutrality. Second, a move to make the economy more resilient against climate shocks because, as discussed in chapter 1, DR's high exposure to climate change is likely to have far-reaching macroeconomic, poverty and distributional effects.

### 4.1. The narrow corridor: Achieving the NDS vision in an economy facing headwinds

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**To realize its climate goals, DR must navigate two transformative transitions that have considerable macroeconomic implications.** As illustrated in chapter 1, the country's high vulnerability to climate change underscores the need for a more climate-resilient economy. Second, the country must make a structural transition from being a net emitter to achieving carbon neutrality. As outlined in section 3.2.5, there are multiple reasons to decarbonize, most significant of which is to enhance the country's resilience by reducing its dependence on energy imports and environmental health benefits. Overall, DR's pathway to sustainable development and climate resilience will involve addressing structural economic challenges, supporting affected communities, diversifying the economy, embracing new technologies, securing substantial investments (chapter 3), and raising fiscal revenues to partially finance the climate transition and the development goals.

**However, the existing macroeconomic conditions impose constraints on the economy's ability to finance the costs of the development and climate transition, and to implement the necessary policies to facilitate it.** The DDR has demonstrated impressive vigor in its growth trajectory, achieving an average annual growth rate of 5.4 percent in the 2005–2022 period. This performance can be attributed i) to the implementation of prudent monetary and fiscal policies, which have played a central role in fostering macroeconomic stability, and ii) to foreign direct investment (FDI) inflows (averaging approximately 4 percent of GDP over 2005–2022) to key sectors such as tourism, services, manufacturing, construction, and mining. Although GDP output has fully recovered from the COVID-19 pandemic, the government operates in a constrained fiscal environment. This includes rising interest payments, rigid recurrent spending, and a tax-to-GDP ratio of 13.8 percent in 2022, well below the LAC average, resulting in a lack of fiscal space to meet the social, environmental, and infrastructure demands of the current society—let alone the development and climate transition.<sup>178</sup>

**At the same time, the rising frequency of climate change-related natural hazards could negatively impact GDP, exacerbate poverty, and lead to financial and fiscal costs.** To navigate this climate transition and attain its developmental objectives, the government faces the difficult challenge of carving out additional fiscal space in an economy already fraught with structural development constraints and a complex fiscal position. The need to generate additional revenue is imperative, alongside the necessity to mitigate pressures on the country's external accounts, which are likely to encounter increased difficulties because of climate change because exports from tourism, though still growing, are expected to be lower than baseline. Additionally, the development of a fiscal risk strategy aimed at reducing the budgetary uncertainty around natural hazards exposure is crucial for a more realistic assessment of current constraints. These complexities present an opportunity for the economy to push a diversification agenda. In the following sections, each of these challenges will be explored.

#### 4.1.1. The structural development challenges that condition DR's future

**To forge a path toward prosperity, the country will need to make proactive choices and embrace unavoidable reforms.** This involves promoting social and economic inclusion, encouraging savings and investment, enhancing human capital, and boosting productivity. These four objectives, although conceptually distinct, form part of a functionally integrated and interconnected strategy that would drive economic growth, job creation, and environmental sustainability and generate the public resources to provide needed public services. There are, nevertheless, four bottlenecks that could slow the pace of the development and climate transition:

- » **Low productivity growth:** As stated in chapter 1, the DR has maintained an impressive growth rate for several years more because of *factor accumulation* than of *rising productivity*. As a result, lagging productivity has contributed to depressed real wages in a country that already has high regional economic disparities.<sup>179</sup> Several factors and policy distortions have contributed to the sluggish productivity growth observed in recent years, and together they create systemic barriers and inefficiencies throughout the economy. Additionally, climate-related natural disasters have adversely impacted productivity by disrupting supply chains and damaging infrastructure. Inadequate human capital, characterized by a shortage of skilled workers and limited investment in education and training, has also hindered productivity growth. Furthermore, the economy's low competition has diminished the incentives to innovate and improve efficiency. Finally, tax exemptions have potentially resulted in the misallocation of resources, particularly in sectors associated with low-sophistication manufacturing products.<sup>180</sup>

<sup>178</sup> Between 2000 and 2019, interest payments increased by 14.4 percentage points, with debt service reaching almost 20 percent of total revenues. Debt service together with wages, salaries, and current transfers represent over 60 percent of public expenditures, which reduces the budget available to be allocated toward productive investment.

<sup>179</sup> World Bank, *Dominican Republic Country Economic Memorandum - Sustaining Economic Growth* (English) (Washington, D.C. : World Bank Group, 2023), <http://documents.worldbank.org/curated/en/099072523145018880/P1767091452d11731eea1143a418ae716718fe03a5af>.

<sup>180</sup> World Bank, *Dominican Republic Country Economic Memorandum* (2023).

- » **Low human capital and mismatch of skills:** Educational outcomes in the DR are significantly below expectations for its level of economic development and present a principal constraint on the country's productive potential.<sup>181</sup> Compared to workers in the US, the Dominican labor force has an estimated learning gap of 4 years of schooling, despite having been in school for a similar length of time. The shortage of adequate skills in the labor market increases informality, exacerbates inequality, and retards development. It also poses a constraint on building the skills the economy needs in order to adopt new, sustainable technologies. Insufficient investments in human capital carry significant consequences, impacting not only the wellbeing and livelihoods of individuals but also hindering productivity, competitiveness, and impeding the shift toward greener products and economic diversification. Poor educational outcomes directly lead to reduced employability, lower productivity, and depressed wages for workers, and are often linked to high dropout rates among teenagers in secondary education.<sup>182</sup>
- » **Limited formal firm growth:** More than 50 percent of the Dominican economy operates in the informal sector given that firm growth and expansion in the formal sector is limited. This poses challenges for sustainable economic development.<sup>183</sup> It locks physical and human capital into less productive enterprises with limited potential to grow, resulting in various negative economic consequences such as underdevelopment and low productivity, wages, and skill levels. Like low human capital, it also undermines technology adoption. Additionally, the presence of a large informal sector limits the government's ability to generate revenue and invest in activities that promote long-term growth.<sup>184</sup> Finally, informality also makes it difficult to enforce existing or new regulations that would support sustainable climate action.
- » **Significant infrastructure gaps:**<sup>185</sup> Public sector investment in infrastructure has decreased in recent years, and private sector participation via PPPs has not compensated for this trend. A reliable road and port network with sound infrastructure is crucial for a small, trade-dependent economy to effectively establish functional, domestic supply chains, boost productivity and competitiveness, and integrate firms in global value chains. However, the prospects for significant growth in public investment are limited because of fiscal constraints and because of its lower priority compared to other spending needs. The transport sector's experience with private investment, while relevant, has had mixed results: although port and airport projects have had good performances, some roads concessions have suffered from early termination related to large contingencies.<sup>186</sup> The electricity sector has particularly noticeable shortcomings (chapter 3). It is characterized by high costs of supply, the absence of real competition in generation, frequent outages, and a financially unsustainable distribution segment that requires large subsidies from the central government.<sup>187</sup>

**Responding to climate change effectively depends on overcoming these development challenges.** Investments in productivity-enhancing innovations can accelerate a country's economy-wide productivity growth, but the extent of their success depends on the availability and adequacy of complementary factors such as education, infrastructure, the efficiency of markets, and the quality of institutions, including the extent of informality. Infrastructure gaps pose a major obstacle because efficient, climate-resilient infrastructure is necessary for an effective climate response. Additionally, DR's chronic infrastructure underspending simultaneously undermines inclusion (through poor access to basic services) and productivity, while hindering the economy's competitiveness. The challenges of informality also need attention: a formal economy can enforce green regulations better. Moreover, inadequate human capital and skills hamper adaptation to eco-friendly methods, affecting climate response. Low productivity can deter green investments. Thus, addressing these issues is vital for a robust climate change response.

<sup>181</sup> *Creating Markets in the Dominican Republic. Country Private Sector Diagnostic (CPSD)*. World Bank Group.

<sup>182</sup> World Bank, *Dominican Republic Country Economic Memorandum* (2023).

<sup>183</sup> World Bank, *Poverty & Equity Brief: Dominican Republic* (Washington, DC: World Bank, 2023), [https://databankfiles.worldbank.org/public/ddpext\\_download/poverty/987B9C90-CB9F-4D93-AE8C-750588BF00QA/current/Global\\_POVEQ\\_DOM.pdf](https://databankfiles.worldbank.org/public/ddpext_download/poverty/987B9C90-CB9F-4D93-AE8C-750588BF00QA/current/Global_POVEQ_DOM.pdf).

<sup>184</sup> H. Ulku and G. Zaourak, *Unleashing Central America's Growth Potential* (Washington, DC: World Bank, 2021), <https://doi.org/10.1596/36440>.

<sup>185</sup> World Bank, *Dominican Republic: Systematic Country Diagnostic* (Washington, DC: World Bank, 2018), <https://documents.worldbank.org/en/publication/documents-reports/documentdetail/980401531255724239/dominican-republic-systematic-country-diagnostic>.

<sup>186</sup> World Bank, *Dominican Republic Infrastructure Sector Assessment Program (ISAP)* (Washington, DC: World Bank Group, forthcoming).

<sup>187</sup> World Bank, *Creating Markets in the Dominican Republic. Country Private Sector Diagnostic (CPSD)*. (Washington, DC: World Bank Group, 2023), <https://www.ifc.org/content/dam/ifc/doc/2023/dominican-republic-country-private-sector-diagnostic-en.pdf>.



#### 4.1.2. A challenging fiscal situation that will require additional space

**Robust economic growth has contributed to the DR's relatively prudent fiscal position, but there are long-term sustainability risks.** Consolidated public debt has risen consistently over the last decade, peaking during COVID-19 at 69.1 percent of GDP in 2021. In 2022, effective debt management and good economic performance led to a reduction of debt to 58.6 percent of GDP. However, long-term sustainability risks persist as debt remains above pre-pandemic levels, new expenditure needs arise, and the budget is exposed to uncertainty around natural hazards. At the same time, fiscal revenues are still below the regional average. The country's limited tax revenue growth, combined with the fact that approximately one-fifth of tax revenues are allocated to servicing debt, resulted in a decline in public investment from 3.2 percent in 2000 to 2.6 percent of GDP in 2022. However, there are still opportunities to improve DR's response to disaster risks, particularly those induced by climate-related events. However, the current fiscal strategy in the country is limited, relying primarily on budget allocations of up to 1 percent of current revenues, and on credit loans from the Central Bank and multilateral institutions.

**Furthermore, the tax system has significant room to improve to make it both more productivity-enhancing and supportive of climate action.** Low tax revenues can partly be attributed to an overly complicated tax system. The DR's tax base is extremely narrow because of an extensive number of exemptions, deductions, zero-ratings, and allowances across all major tax categories. A high tax threshold implies that only 14 percent of formal workers are subject to personal income taxes. Additionally, the prevalence of informal economic activities reduces the tax base even further. In 2022, tax expenditures amounted to an estimated 4.6 percent of GDP (33.3 percent of total tax revenues), of which value-added tax (VAT) exemptions alone accounted for 2.6 percentage points. Improving the alignment of revenue and expenditure policies to the imperatives of climate change in DR could offer a very significant opportunity to create fiscal space while also providing incentives to guide private sector behavior and attract private investment. Given the complexity of DR's emission profile, it will be important for authorities to consider the joint impact of all policies that have both fiscal and environmental implications, rather than focus on just one instrument or a limited set of them.

**In this regard, high energy subsidies also constrain the country's fiscal space, undermining spending efficiency.** The electricity sector exerts significant resource pressures on the state, with an average share in total expenditures of 8 percent during 2008–2022, or an average transfer of 1.4 percent of GDP (2010–2022). This deteriorated in 2022, with transfers to the former but now defunct Dominican Corporation of State Electrical Companies (*Corporación Dominicana de Empresas Eléctricas Estatales*, or CDEEE) four times higher than they were in 2019. Despite high public fiscal support, DR's electricity service quality indicators are among the lowest in LAC.<sup>188, 189</sup> Given the comparatively high emission intensity of DR's electricity generation, these subsidies represent a negative price to carbon, which incentivizes excessive use of electricity while discouraging investment in non-emitting technologies. Agricultural subsidies to fertilizers and other practices, although smaller in scale, also create a relevant drag on fiscal outcomes, and their detrimental medium-term implications for emissions and the environmental sustainability of agriculture in DR are potentially large.

**Improvement in the energy sector can enhance a country's industrial output, innovation capability, job creation rate, and attractiveness to global markets, thereby contributing significantly to its overall competitiveness on the world stage.** Improvements in electricity distribution from 2009 to 2019 have reversed since the pandemic. From January 2021 to June 2023, the frequency of interruptions —captured as the system's average interruption frequency index (SAIFI)— increased from 8.7 to 24.5, while the duration of the interruptions (measured as SAIDI, or the System Average Interruption Duration Index) rose from 6 to 17 hours, almost triple the January 2021 level. Frequent and long power outages have a direct impact on business productivity and competitiveness.

<sup>188</sup> The average customer on the public power grid experienced 18 interruptions and 22 blackout hours per month in 2020, far above the averages of regional peers such as Panama and Costa Rica. See <https://sie.gob.do/estadisticas/estadisticas-direccion-regulacion/>.

<sup>189</sup> Functions from CDEEE were transferred to the MEM under presidential decree 342-20.

**The tax system also has a relevant role to play in obtaining fiscal resources and the alignment of private incentives.** Enhanced environmentally related taxes (ERTs) would better support mitigation and provide much-needed fiscal revenue.<sup>190</sup> However, ERTs represent just 1.81 percent of GDP, below the average in OECD (Organization for Economic Co-operation and Development) countries, which is 2.3 percent. Taxes on energy (specifically, excise taxes on diesel and petrol) account for the largest share, followed by revenue from motor vehicles and transport services (taxes on use and ownership of vehicles, departure tax, excises on vehicles).<sup>191</sup> Revenues from taxes on fuels amounted to 1.5 percent of GDP (2005–2022), equivalent to the transfers to the electric sector. Unlike many other countries in the region, the DR does not subsidize liquid fuels. Liquid fuels are priced according to an import parity price rule,<sup>182</sup> an excise-specific tax (Ley 112-00) and an *ad-valorem* tax (set at 16 percent by Ley 495-06). A similar system applies to natural gas prices, resulting in consumer prices that are above supply costs. The tax on vehicle emissions was introduced in 2013, but as of 2022 it contributes just 0.1 percent of total tax revenue.

**Future debates about tax reform proposals could explore energy taxes, including carbon taxation.** This would involve levying a tax on carbon emissions, thus incentivizing individuals and businesses to adopt more environmentally-friendly practices and reduce their carbon footprint, which would help meet the country's environmental goals (specifically, air quality goals) and contribute to the resources needed to meet its developmental goals. Box 4.1 discusses additional options to improve tax revenue collection and open up fiscal space to spend on social, infrastructure and climate investments.

**A carbon tax could support the achievement of climate change targets.** Although the complete formulation and design of a carbon tax is beyond the scope of this CCDR, simulations for this report show that the introduction of an economy-wide carbon tax in 2023 that rises linearly to US\$30 per ton CO<sub>2</sub> by 2030 could raise up to 0.8 percent of GDP. Additionally, a carbon tax has multiple co-benefits that make it a very attractive source of additional revenue. If the carbon tax of US\$30 per ton of CO<sub>2</sub> is included in the package of mitigation measures outlined in section 3.2.5, emissions could decline to 23.8 Mt CO<sub>2</sub>e by 2050. This represents an additional 4 percentage point decline relative to the emissions projected with the current mitigation measures, but it is still far from net-zero. However, if these conditions are not in place, the technological substitution that drives part of the reduction in emissions and partially mitigates the impact on final prices will be missing, and the efficiency of the carbon tax will be reduced.

**Designing effective carbon taxes requires careful consideration of multiple elements tailored to the specific conditions prevailing in DR.** Commonly seen in countries worldwide, carbon taxes often coexist with other energy taxes. The most commonly seen arrangement (for example, in Colombia and Mexico) is that carbon taxes are set at levels such that other taxes have a larger incidence on the final price paid by consumers. What matters is that the combined tax charges align with the external costs of various fuels, encompassing their GHG emissions, road congestion, air pollutants, accidents, and so on. Research has extensively analyzed these costs.<sup>192</sup>

**While administratively more difficult to implement, tax instruments can also contribute to mitigation in other emitting sectors.** Feebate schemes are one example. Feebates for agricultural producers that apply a sliding scale of tax rates depending on the emission intensity of agricultural exploitation have been proposed as potentially attractive instruments. Similarly, property taxes can be designed to discourage deforestation<sup>193</sup> and offer incentives to owners that adopt sustainable landscape management practices.

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<sup>190</sup> An environmentally related tax (ERT) is a tax whose base is a physical unit (or a proxy of a physical unit) of something that has a proven, specific, harmful impact on the environment, regardless of whether the tax is intended to change behaviors or is levied for another purpose. In all, DR has 188 ERTs that can be classified in four mutually exclusive tax-base categories for data purposes: energy, transport, pollution, and resources.

<sup>191</sup> OECD, Inter-American Center of Tax Administrations, Economic Commission for Latin America and the Caribbean, and IDB, *Estadísticas tributarias en América Latina y el Caribe 2020 (Revenue Statistics in Latin America and the Caribbean 2020)* (Paris: OECD Publishing), <https://www.oecd.org/tax/tax-policy/brochure-estadisticas-tributarias-en-america-latina-y-el-caribe.pdf>.

<sup>192</sup> I. Parry and J. Strand, *International Fuel Tax Assessment: An Application to Chile* (Washington, DC: International Monetary Fund, 2011), <https://www.imf.org/external/pubs/ft/wp/2011/wp11168.pdf>.

<sup>193</sup> Conversely, certain tax instruments create incentives to convert forests into agricultural land when, for example, they provide reduced tax rates for agricultural activities.

Finally, the taxation of waste products (through municipal collection charges or through specific charges for certain materials, for example) has been shown to be effective in supporting broader efforts at reducing emissions.<sup>194</sup>

### Box 4.1 Options to Improve DR's Fiscal Space

**Each measure represents a potential path toward a more efficient, effective, and equitable tax system in the Dominican Republic, which allows to increase revenue collection:**

<b>Streamlining Tax Expenditures</b>	The Dominican Republic's (DR) tax-expenditure framework has potential for improvement. Phasing out tax expenditures, such as VAT exemptions, PIT deductions, and specific incentives targeted at certain sectors or firms, could simplify tax administration and boost revenue.
<b>Broadening the Tax Base and Enhancing Efficiency:</b>	Applying the standard VAT rate to most currently exempted goods could broaden the tax base, with increased fiscal spending suggested to counter potential negative impacts on vulnerable households. Also, a PIT reform program could advance social objectives. This could involve lowering the PIT's eligibility threshold, thus widening the tax base, and enhancing structural progressivity by applying higher marginal rates to high-income earners.
<b>Revision of Corporate Tax Incentives:</b>	Existing corporate tax incentives, including tax holidays for Special Economic Zones (SEZs), should be reviewed and potentially consolidated to ensure tax neutrality across firms and sectors.
<b>Increase in Excise Taxes</b>	There's potential for raising revenue by increasing excise taxes on fuel, alcoholic beverages, and tobacco, which also helps internalize the social and environmental costs associated with their consumption.
<b>Redesigning the Property-Tax Regime:</b>	Property tax bases and rates could be regularly adjusted to reflect market changes, aiding in revenue collection. Modern administrative systems, inclusive of updated land and property registration, would support this reform.
<b>Incorporation of Environmental and Climate Change Considerations</b>	The existing contradiction between the tax on vehicle emissions and fuel subsidies necessitates a reevaluation of the subsidy while maintaining fuel prices at a consistent level. A carbon tax could also help curb emissions, while generating new sources of revenue collection.
<b>Reform to the procurement law:</b>	Improving the efficiency of the procurement process can lead to fiscal savings of up to RD\$4.6–5.3 billion (equivalent to 0.1 percent of GDP) and greater competition in product markets.

Source: Country Economic Memorandum (2023); Dominican Republic Tax System Review (2021).

#### 4.1.3. Pressures on the external accounts challenge the transition

**Diversification is required to address the impacts of climate change on the external accounts.** Tourism will be one of the main sectors affected by climate change, with an estimated reduction in revenues of 7–16 percent by mid-century, and additional potential losses derived from sargassum growth.<sup>195</sup> Given that tourism is one of the main sources of financing in the balance of payment, it lies at the heart of the external sustainability of the country and its fiscal accounts. Net exports need to increase to cushion the likely decline of tourism and agriculture exports due to climate change. Increases in net exports are typically

<sup>194</sup> See, for example, Thornton Matheson, *Disposal is Not Free: Fiscal Instruments to Internalize the Environmental Costs of Solid Waste* (Washington, DC: IMF, 2019), <https://doi.org/10.5089/9781513521589.001>.

<sup>195</sup> These numbers are conservative because the estimation of revenues cannot account for the evolution of sargassum as a result of limitations in data availability and modeling strategy.

achieved by a reduction in imports and/or diversifying the export basket and trading partners. A reduction in imports is either achieved through a fall in domestic demand or an increase in prices (depreciation of the exchange rate) that induces a substitution effect. Given that a large share of the government's debt is exposed to exchange rate fluctuations, a depreciation of the Dominican peso would put more pressure on fiscal sustainability. In the case of DR, the transition from an energy matrix that relies on fuel imports toward a greener energy matrix will contribute to reducing imports, but this will not be enough to compensate for the expected decline in exports due to climate change. What this means is that diversifying the economy is simply indispensable to navigating the climate transition.

**The DR's exports are heavily concentrated in products with low economic complexity, such as tourism, agricultural commodities, and gold.** However, the country is starting to establish a foothold in more complex, green value chains. Some DR exports in this area include non-alloy steel bars, electrical switches, and plastic products that are part of the wind energy, solar photovoltaics (PV), and electric vehicle supply chains. These products are manufactured in export-oriented industrial parks benefiting from the Special Economic Zones fiscal regime. As the global economy decarbonizes, the DR could strengthen its contribution to green global value chains by diversifying and upgrading the range of products the DR exports. As other countries demand relatively less oil, gas, and coal, they will also demand more "environmentally" friendly products, opening the door to new opportunities that will require compliance with more rigorous international standards, quality controls, traceability of products, and other regulations.

**The Dominican Republic, traditionally known as an important exporter of agricultural products<sup>196</sup> such as sugar, cocoa, avocados, bananas, plantains, and tobacco —almost 17 percent of its total exports— faces a pressing need to diversify its exports because of vulnerabilities posed by climate change and the gradual need for sustainable value chains.** Increasing DR's agricultural exports will require a multi-pronged, holistic approach that includes bolstering resilience, enhancing productivity, adopting sustainable practices, improving market linkages, and generating improvements in value per unit of exported product. This holistic approach is crucial to making agriculture practices use resources more efficiently and to avoiding environmental impacts, including reducing the pressure on forests. Similarly, efforts must be invested in promoting organic farming and agroforestry systems that not only safeguard the environment but also cater to the increasing global demand for sustainable and deforestation-free products.

## **4.2. Adapting to the Green Economy: Building a robust social safety net for displaced workers and climate policies to reduce poverty**

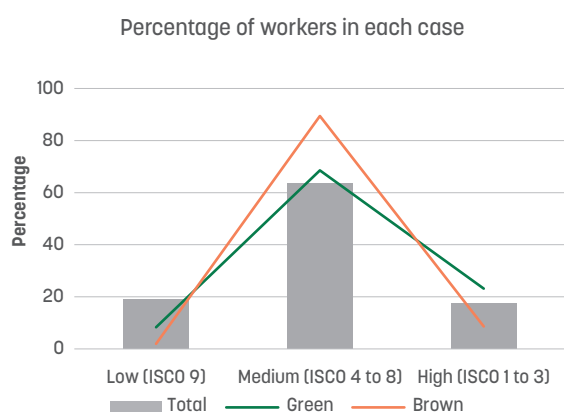
**Labor market policies are needed during the transition to greener growth to mitigate its adverse impacts on the poor and the vulnerable.** In the Dominican Republic, 14 percent of employment is in green jobs, 6 percent in "brown" jobs, and 80 percent in a residual category.<sup>197</sup> Workers in brown jobs face a higher risk of displacement because of the shift away from environmentally harmful economic activities. On the other hand, those in green jobs are better positioned for a transition to green energy. Workers with lower educational levels are at higher risk of unemployment because they tend to be in brown jobs.<sup>198</sup> While there are overlaps in the skills required for brown and non-brown jobs, including green ones, in many cases non-brown occupations involve different kinds of tasks that require workers with different types of skills (figure 18).

<sup>196</sup> These agricultural products include vegetables, animals, wood and paper. Data from ATLAS of economic complexity, <https://atlas.cid.harvard.edu/>.

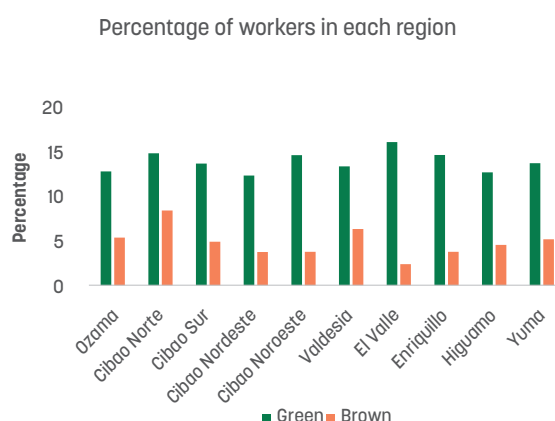
<sup>197</sup> F. Vona, G. Marin, D. Consoli, and D. Popp, *Environmental Regulation and Green Skills: An Empirical Exploration* (Journal of the Association of Environmental and Resource Economists, 2018): 713–53, <https://doi.org/10.1086/698859>. We consider green occupations to be the 204 jobs identified under the O\*NET SOC classification (8-digit), where the Occupational Information Network (O\*NET) is a US free online database that contains hundreds of job definitions, and the Standard Occupational Classification (SOC) is the US federal code for occupations. O\*NET defines the green economy as encompassing "the economic activity related to reducing the use of fossil fuels, decreasing pollution and greenhouse gas emissions, increasing the efficiency of energy usage, recycling materials, and developing and adopting renewable sources of energy." We define as brown occupations the 85 jobs identified under the SOC (6-digit) classification in Vona et al. (2018). They are those occupations that are more likely to be employed in pollution-intensive industries in the US economy. The approach undertaken by Vona et al. (2018) involved three steps.

<sup>198</sup> J. Rigolini, *Social Protection and Labor: A Key Enabler for Climate Change Adaptation and Mitigation* (Washington, DC: World Bank, 2021), <https://documents1.worldbank.org/curated/en/356911638776148708/pdf/Social-Protection-and-Labor-A-Key-Enabler-for-Climate-Change-Adaptation-and-Mitigation.pdf>.

**FIGURE 18.** Distribution of workers by skill level



**FIGURE 19.** Relative share of green and brown workers within each region



Source: World Bank staff elaboration using Encuesta Nacional Continua de Fuerza de Trabajo (2023).

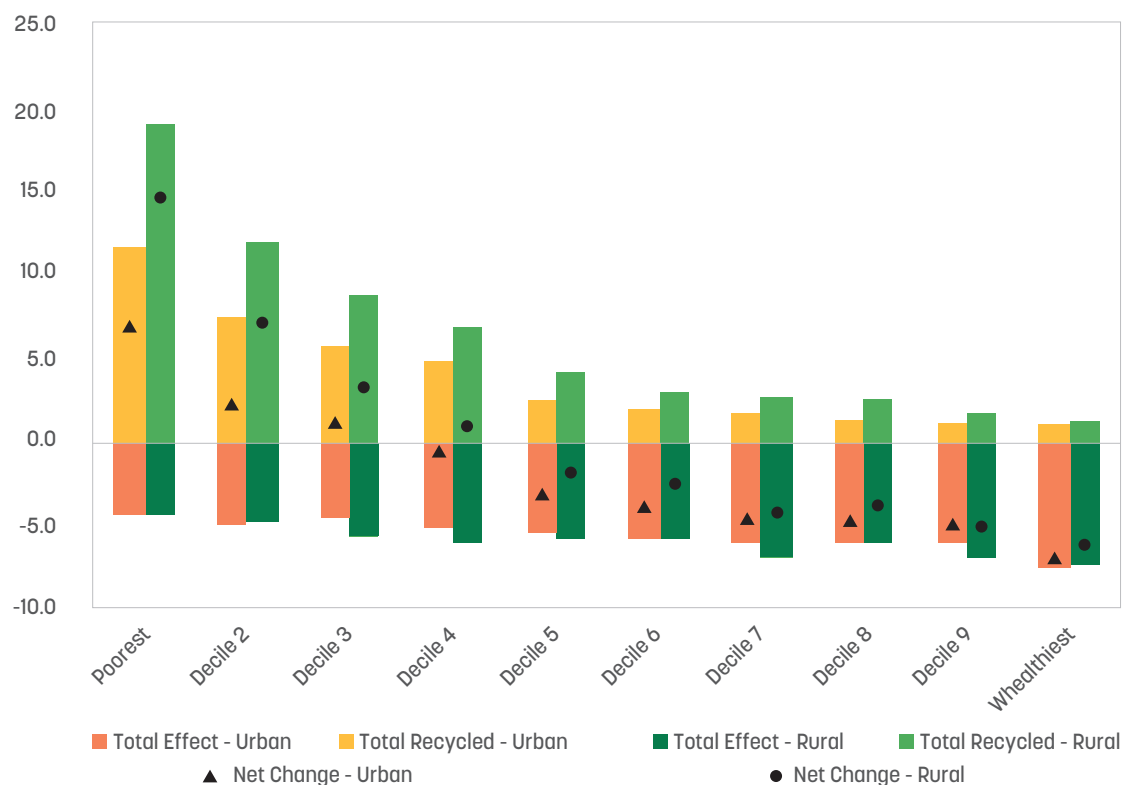
**A combination of labor market, social protection, and skill development policies is essential to preparing workers for future job demands.** For example, retraining programs can help truck drivers transition into roles such as insulation workers. It will be important to focus these programs on sectors with economic growth opportunities. Jobs in these sectors may not necessarily be green but would offer opportunities for work outside of brown jobs for displaced workers. Beyond skills training, spatial differences in the location of brown and non-brown jobs —employment rates in brown jobs are higher in Cibao Norte and Valdesia— means that a transition away from brown jobs will likely require support for workers to find jobs in other geographic areas (figure 19). The program SUPERATE, under its Economic and Financial Inclusion pillar, could be critical to the effort to create greener jobs. Additionally, policies that support the development of skills suited to the new demands of green growth can be complemented by employment services that support improved job search and better matches between workers and employment opportunities. Nevertheless, unless the country guarantees good-quality basic education for everyone, retraining programs will likely have limited effectiveness.

**Climate taxes can have undesirable effects that can nevertheless be managed through appropriate complementary interventions.** A carbon tax, for example, would certainly mean higher energy costs. Correcting the fossil fuel prices to their efficient levels would indeed have an effect on households, but the revenues raised through carbon taxation and the recycling channels could help to make this effect more progressive. The simulations presented in the previous subsection assume that 50 percent of the additional revenue generated is used to increase public investment, and the other 50 percent transferred to households. This policy partially mitigates the macroeconomic impact of higher energy prices. Figure 20 shows the relative mean consumption effect (urban versus rural households) in terms of percent of consumption variations by 2030. In this scenario, the policies in place allow the most vulnerable households to increase their consumption, but reduce the consumption power of wealthier households, for all scenarios in both urban and rural areas.

**The design of carbon tax policy should also minimize allocative distortions.** Although carbon taxes reduce negative climate externalities, they may amplify other market distortions such as credit constraints, labor costs, and entry barriers. The results of analyses made for this report show that firm emissions intensity is positively correlated with existing distortions to the allocation of firms' inputs (capital and labor).<sup>199</sup> Consequently, carbon taxes should be targeted at sectors that are more polluting and with the least impact on allocative inefficiencies. To ameliorate the strain on profitability that carbon taxes may have on firms, a compensation mechanism for compliance with the tax policy should be implemented, focused on firms with low emission levels.

<sup>199</sup> Ferro et al., *Implementing a Carbon Tax in the Dominican Republic: A Qualitative Assessment of the Exposure* (2023), Working Paper.

**FIGURE 20.** Relative mean consumption effect (urban vs. rural) by 2030



Source: World Bank staff using CPAT (2023).

**The preceding examples emphasize the need for reforms that increase the flexibility of the economic system in order to minimize the costs of the decarbonization transition.** In this regard, a carbon tax could be combined with a reduction in tax exemptions. Even though certain tax exemptions have played a role in attracting foreign direct investment (FDI) and expanding export diversification, others have stimulated misallocation by allowing less productive firms to operate. By supporting less productive activities that otherwise would not be profitable, these programs encourage the misallocation of talent by enabling less productive workers in subsidized firms to earn as much as more productive workers in larger firms.<sup>200</sup>

### 4.3. Financing the resilient net-zero scenario

**Since public sector fiscal space is limited, additional climate financing from the private sector will need to be mobilized.** To meet its updated NDC commitments, the DR is heavily dependent on external finance, with the private sector estimated to contribute 71 percent of investments to meet the country's unconditional mitigation targets.<sup>201</sup> From 2010 to 2015, the Dominican Republic received US\$499 million in climate finance (close to 0.5 percent of GDP), with US\$465.2 million<sup>202</sup> as official development assistance (ODA) loans and the rest as grants.<sup>203</sup> From this, 45 percent supported mitigation activities, 13 percent was for adaptation, and 42 percent targeted both. Climate funding has focused primarily on water and sanitation, followed by transport and urbanization.

<sup>200</sup> World Bank, *Dominican Republic Country Economic Memorandum* (2023).

<sup>201</sup> UNFCCC, *Technical Assessment of Climate Finance*.

<sup>202</sup> These estimates are based on data from the OECD Development Assistance Committee's Creditor Reporting System (CRS). Aid includes bilateral payments from donors to recipients and funds channeled through multilateral development agencies. This can take the form of grants, soft loans, and/or technical assistance.

<sup>203</sup> A. Atteridge, N. Canales, and G. Savidou, *Climate finance in the Caribbean region's Small Island Developing States*, Working Paper 2017-08 (Stockholm Environment Institute, 2017), <https://mediamanager.sei.org/documents/Publications/SEI-WP-2017-climate-finance-caribbean.pdf>.

**As the Dominican Republic focuses on maintaining fiscal sustainability within a limited fiscal space, there is a concern that the financial resources needed to invest in the climate transition will be limited.** Striking a balance between existing fiscal compromises and climate transition will be crucial to ensure a resilient and sustainable. This balance could involve promoting green investments, strengthening public investment management to improve delivery, and adopting mitigation strategies like the introduction of a carbon tax and the reassessment of subsidies and exemptions. It is equally essential to adopt measures that dampen the effects of economic shocks, such as channeling funds into resilient infrastructure. Remedial actions may include compensating affected communities (for example, poor households and farmers), and employing insurance and contingency funds. Overall, however, financing the climate transition is a complex challenge that requires innovative approaches and collaborative efforts from government, private sector, and civil society. Additional sources of finance, such as green bonds and international cooperation, are needed. Innovation through the use of blended finance models should be encouraged for both private sector investment and public-private partnerships.

**A net-zero resilient pathway for DR would require substantial public and private sector investments by 2050, as well as maintaining existing fiscal prudence.** Priority actions to reduce GHG emissions and adapt to climate change are described in detail in chapter 3, and accompanying additional investment needs are summarized in table 1.

**A pathway to a funding strategy will need efforts from both the private and public sectors, with one funding scenario suggesting that the additional financing needs will amount to 2.2 percent of GDP between 2023 and 2030, and 1.2 percent of GDP between 2031 and 2050.** The government ought to encourage private investment to cover approximately 70 percent of the overall expenses associated with the transition, which in our estimates amounts to 1.1–2 percent of GDP. On the government side, reforms aimed at broadening the base should be prioritized in order to increase revenue mobilization to finance the climate transition. Additionally, spending efficiency measures, such as changes in the procurement process, and a reformulation of utility subsidies, could free up to 0.4 percent of GDP in additional resources. There is also an opportunity to introduce a carbon tax that would help in raising additional fiscal revenues of about 0.8 percent of GDP, while redirecting economic activity toward a lower-emitting path. Table 2 summarizes the scenario of funding contemplated in this CCDR. Finally, compensation measures to avoid unintended harmful effects of such measures on the poor (for example, the rise in energy prices derived from a carbon tax) could amount to 0.3 percent of GDP.

**TABLE 2.** Navigating the climate transition: A funding strategy for the Dominican Republic (as a percentage of GDP)

	2023–2030	2031–2050
<b>Total Public and Private</b>	<b>2.2</b>	<b>1.2</b>
<b>Public Sector (A – B)</b>	<b>0.2</b>	<b>0.1</b>
<b>(A) Climate transition costs</b>	<b>1.4</b>	<b>1.0</b>
Additional Climate Investment	0.7	0.4
Tourism Revenue Loss	0.5	0.5
Social Protection	0.2	0.1
<b>(B) Revenue and expenditure changes</b>	<b>1.2</b>	<b>0.9</b>
Carbon Prices	0.8	0.8
Subsidies	0.3	0.1
Spending Efficiencies	0.1	0
Additional Revenue Measures	0.3	0.3
Measures to Mitigate the Effect of Carbon Prices and Subsidies	-0.3	-0.3
<b>Private Sector</b>	<b>2.0</b>	<b>1.1</b>
Additional Climate Investment	2.0	1.1

Source: World Bank staff elaboration (2023).

### 4.3.1. Deepening financial markets to boost private investment

**Limited access to finance and a shallow financial system limit the ability of DR firms to invest in climate-related projects and to adapt to climate shocks.** Access to financial markets allows firms to fund the purchase of fixed assets and working capital. Domestic credit to the private sector as a percentage of DR's GDP (27.9 percent) significantly lags regional and income peers (LAC 57.2 percent; upper-middle income countries 141.0 percent). Authorities are currently taking commendable steps to address this, for instance, by strengthening the regulatory framework for financial consumer protection and establishing Market Conduct Supervision, which helps foster wider use of financial services and safeguard consumers. The government is also strengthening the Open Finance Framework to stimulate innovation by banks, fintech companies, and others. The capital markets regulator (*Superintendencia del Mercado de Valores*) is contemplating regulatory changes aimed at deepening the market to attract institutional investors, thereby increasing capital flow. Pension funds and other institutional investors are increasingly relevant potential providers of long-term finance for low-carbon infrastructure because they manage sizable asset portfolios.

**A more inclusive financial sector could play a crucial role in building the climate resilience of households and firms.** It could provide households and firms with access to savings, credit, insurance, and other financial services to which may not have had access before. This could enable them to invest in measures that protect them from the impact of climate change, such as flood-resistant infrastructure, diversifying livelihoods, or purchasing insurance against climate-related risks. Recognizing the importance of this agenda, the DR developed a National Strategy for Financial Inclusion 2022–2030 led by the Central Bank of the Dominican Republic.

### 4.3.2. Unleashing the possibilities of sustainable finance

**The DR is starting to build its sustainable finance framework.** In 2017, the Multiple Banks Association of the Dominican Republic (ABA) joined the Sustainable Banking and Finance Network (SBFN). Through SBFN, IFC, in partnership with the Government of Canada, has provided support to the country's financial sector. In 2020, the Superintendency of the Securities Market—*Superintendencia del Mercado de Valores del la República Dominicana*, or SIMV—set up the country's green bond market and its national sustainable finance framework through Guidelines for the Issuance of Sustainable, Green, and Social Securities on the Dominican Republic Stock Exchange. The ABA has formed a formal taskforce for national sustainable finance, supported by both regulators and industry, which has conducted awareness raising and capacity building as well as sustainable finance policy development. DR became the first country in the Caribbean to launch a green taxonomy initiative. The "Dominican Republic Green Taxonomy" project was launched in 2022 in collaboration with the IFC through an agreement signed with the Ministry of Environment and Natural Resources (MARENA) and SIMV. This taxonomy will provide the country with a standardized classification system for green assets and activities. The prioritized sectors to start the categorization are energy, transport, construction, information, and communication technologies (ICT), industry, water, and waste.

**The private sector is leading the use of climate finance instruments in DR.** After the establishment of the green bond framework in 2020, in December 2021 the power company EGE Haina launched the first green bond in the country for US\$100 million, authorized by the SIMV, to be used to finance the expansion of its installed capacity for wind power generation. In February 2023, SIMV authorized the second green bond issuance (and the first for a financial institution) to the commercial bank Banco Popular Dominicano for up to US\$50million that will be used to finance or refinance (partially or totally) the bank's green portfolio, green projects related to renewable energy, energy efficiency, sustainable mobility, and circular economy, and eventually those approved by SIMV based on the green taxonomy to be published.

**The DR will need to continue and strengthen its efforts to mobilize climate financing from the private sector.** A combination of financial innovations can help mobilize private capital to meet DR's climate-financing needs. The options include i) employing blended finance; ii) exploring national and regional catastrophe credit lines and bonds; iii) increasing coverage of parametric insurance in industry and agriculture; iv) revamping risk management and resilient investment in tourism infrastructure, v) developing affordable microinsurance products for low-income households, and vi) promoting greater use of technology



in risk assessment and management. To mobilize private sector investment, the DR could leverage the new PPP framework for private participation in infrastructure. Furthermore, a more inclusive financial sector can play a crucial role in building the resilience of households and firms to climate risks.

**The current state of insurance coverage for public assets in the DR remains fragmented, with significant information gaps.** Although a proportion of ministries possess insurance, major public buildings such as schools and hospitals are generally uninsured, and even those that are insured are on an individual basis, with no pooling entity to optimize coverage by taking advantage of risk diversification and a critical mass of the state's asset portfolio. At the same time, road infrastructure has limited insurance coverage: only some motorways built with international financing have catastrophic insurance included in the loan. Insurance products that allow the transfer of part of the disaster risk for public infrastructure are a potentially efficient way to mitigate the burden of contingent liabilities that the government would otherwise assume in the event of a disaster. A good first step could be the adoption of parametric insurance products under the Caribbean Catastrophe Risk Insurance Facility (CCRIF). However, the country needs to improve the quality of its data on natural hazards and risk exposure in order to support accurate risk assessment and pricing of insurance products.

#### 4.3.3. Leveraging the PPP framework

**The new PPP framework for private participation in infrastructure has enhanced the enabling conditions for PPPs.** In February 2020, the DR approved a regulatory framework for Public-Private Partnerships (Law Nr 47-20). Later that year, the PPP Agency was created to promote and regulate PPPs. The new PPP framework has drawn up a diverse range of proposals, mainly originated by the private sector, and mostly in the areas of road and rail transport, and energy.

**For the PPP framework to reach its full potential, there are some challenges that need to be addressed.** The DGAPP needs to work closely with relevant stakeholders within the government and the private sector to make sure the PPP framework functions properly and follows international practices. Key areas that need to be addressed include i) harmonization of the approval process with project preparation maturity; ii) institutional credibility and capacity for project execution; iii) a regulatory framework and approval process for projects that require a differential scheme; iv) sectoral frameworks for concessions versus PPP schemes; and v) funding capacity building in contracting public entities (beyond the PPP unit) in order to execute PPP projects.

#### 4.3.4. Concessional financing

**The DR could also leverage multilateral resources.** Since the country lacks a deep financial market, part of the resources to fund the decarbonization are likely to come from external sources, including multilateral financing. The DR has received concessional financing for climate-related projects from various international organizations and donors, including the World Bank, the IDB, and the Green Climate Fund (GCF). The DR could also tap the IMF's Resilience and Sustainability Trust (RST), conditional on having a financing or non-financing IMF-supported program. Under this facility, DR would be eligible to tap into an additional US\$400-900 million (75-150 of its SDR quota).

## 5. Conclusion and Recommendations

### Main Messages

- Transitioning to a more resilient, low-carbon development path is feasible but will require substantial policy action. Of the 48 recommendations below, twenty have high urgency and high mitigation or adaptation benefits.
- Specific gaps in the legal and institutional frameworks will need to be addressed across sectors. Additional key themes include the need for enhanced inter-institutional coordination, implementation of key reforms, development of specific implementation plans, and the need for additional data to inform decision making in specific sectors.

**The analysis in the chapters above describes diverse actions that could support the Dominican Republic in moving toward a resilient and low-carbon development pathway.** To help prioritize the needed actions, a qualitative expert consultation process was conducted, in which recommendations were selected and grouped in five thematic categories: i) Strengthening Institutions and Governance; ii) Macroeconomic Management, Competitiveness, Jobs and Social Protection; iii) Productive Resilient Landscapes; iv) Low-Carbon Resilient Infrastructure; and v) Private Sector/Financial Sector Mobilization. Recommendations are assessed using four criteria: i) potential climate mitigation and adaptation benefits; ii) urgency, defined as critical in the next five years in order to allow the Dominican Republic to transition to a low-carbon, resilient future; iii) other developmental benefits, such as human capital, economic growth, and natural capital conservation; and iv) potential barriers to implementation, namely missing policy and institutional frameworks, political economy challenges, and inadequate financing. The results are reported below in table 3. In this table, i) a fully shaded clock indicates urgent actions and a half-shaded clock indicates actions to be implemented after the urgent ones (ideally by 2050); ii) one red circle indicates little development or climate benefits, two yellow circles medium benefits and three green circles considerable benefits; and iii) one red circle indicates considerable implementation barriers, two yellow circles some barriers, and three green circles no implementation barriers. The table proposes sequencing of actions *within* categories and subcategories based on the urgency rating, which also reflects that some recommendations are a prerequisite for subsequent activities. The table does not prioritize among categories and subcategories given all actions are relevant, and any prioritization decision should be taken on a case-by-case basis.

**TABLE 3.** Priority actions for resilient, low-carbon development in the Dominican Republic

Policy Actions	Benefits & Barriers		
<b>1. Strengthening Institutions and Governance</b>			
<ul style="list-style-type: none"> <li>⌚ Pass a climate change framework law that sets long-term targets, clarifies institutional mandates, and establishes a hierarchy of strategies and plans</li> <li>⌚ Develop a long-term decarbonization and resilience strategy that creates sectoral milestones by 2050 Build the capacity of subnational governments to incorporate climate risk in planning and investment</li> <li>⌚ Enhance public knowledge of climate change and develop capacity for independent expert advice</li> <li>⌚ Increase the availability of geographically disaggregated data, including climate risk information to inform government, firm and household decision making</li> <li>⌚ Align public finances with climate priorities through better use of the national budget and screening of public investments for climate risks</li> </ul>	<p>Development Benefits</p> <p>●○○</p>	<p>Human Capital</p> <p>●○○</p> <p>Growth</p> <p>●○○</p> <p>Conservation</p> <p>●●○</p>	
	<p>Climate Benefits</p> <p>●●●</p>	<p>Adaptation</p> <p>●●●</p> <p>Mitigation</p> <p>●●○</p>	
	<p>Implementation Framework (Barriers)</p> <p>●●○</p>	<p>Policy and institutional frameworks</p> <p>●●○</p> <p>Political Economy</p> <p>●●○</p> <p>Financing</p> <p>●●●</p>	

Policy Actions

Benefits & Barriers

2. Macroeconomic Management, Competitiveness, Jobs and Social Protection

2.1 Macro Management

<ul style="list-style-type: none"> <li>● Reassessment of the tax system by reevaluating tax expenditures, revising corporate incentives, and reform the property tax</li> <li>● Improve expenditure efficiency by rationalizing and reevaluating current subsidies, such as fuels subsidies</li> <li>● Develop a comprehensive disaster risk financing strategy that includes risk transfer and retention instruments, such as parametric insurance products, national and regional catastrophe credit lines, and bonds.</li> <li>● Introduce a carbon tax while protecting the poor from negative impacts</li> <li>● Minimize fiscal risk exposure from natural disasters by creating a strategy for budget stability and financial protection</li> </ul>	Development Benefits ●●○	Human Capital Growth Conservation	●●○ ●●● ●○○
	Climate Benefits ●●●	Adaptation Mitigation	●●● ●●○
	Implementation Framework (Barriers) ●●○	Policy and institutional frameworks Political Economy Financing	●○○ ●●○ ●●○

2.2 Competitiveness

<ul style="list-style-type: none"> <li>● Increase productivity by stimulating competitive markets, revamping the innovation strategy, reducing barriers to access credit, and also by expanding digitization</li> <li>● Pursue export diversification and increase the export participation of products with high value-added, including by attracting sustainable foreign direct investment in non-traditional sectors, and improving transport and logistics</li> </ul>	Development Benefits ●●○	Human Capital Growth Conservation	●○○ ●●● ●○○
	Climate Benefits ●●○	Adaptation Mitigation	●●● ●○○
	Implementation Framework (Barriers) ●●○	Policy and institutional frameworks Political Economy Financing	●●○ ●●○ ●●○

2.3 Jobs and Social Protection

<ul style="list-style-type: none"> <li>● Strengthen the Adaptive Social Protection (ASP) delivery system (social registry and payments) by leveraging its connection with DRM systems</li> <li>● Address the gaps in knowledge and skills to strengthen the productivity, flexibility, and innovative capacity of the labor force, such as implementing policies that better align skills with market needs</li> <li>● Develop active labor market programs to help workers transition away from environmentally unfriendly industries, and mitigate geographic impacts of climate change and mitigation on labor force</li> <li>● Support demonstration projects and build evidence base for interventions to reduce heat stress exposure (e.g. active and passive cooling, changes to work practices, establishment of cooling centers, air conditioning, green roofs and tree planting)</li> <li>● Targeted subsidies to cushion damage of environmentally friendly policies — Compensations to affected populations (e.g., poor households, farmers)</li> </ul>	Development Benefits ●●○	Human Capital Growth Conservation	●●● ●●○ ●○○
	Climate Benefits ●○○	Adaptation Mitigation	●●○ ●○○
	Implementation Framework (Barriers) ●●○	Policy and institutional frameworks Political Economy Financing	●○○ ●●○ ●●○

Policy Actions	Benefits & Barriers		
<b>3. Productive Resilient Landscapes</b>			
<b>3.1 Agriculture</b>			
<ul style="list-style-type: none"> <li>🕒 Build agroecological and agroclimatic zoning information availability and use for key value-chains (ministries and farmers) to improve decision-making and support development of agricultural risk management products</li> <li>🕒 Improve agricultural value chains, tackling challenges such as: poor post-harvest handling, insufficient cold storage, substandard packaging, cold chain gaps, inefficient customs inspections for shipped goods</li> <li>🕒 Strengthen institutions and implementation capacity for agricultural management to support enhanced technical assistance, knowledge exchange/transfer (extension services) and increased R&amp;D for greater climate resilience</li> <li>🕒 Establish cost-effective monitoring and verification and value chain traceability to ensure that policies are achieving country development goals and to support knowledge base for carbon market participation</li> <li>🕒 Support adoption of climate-smart rice, crop and livestock production measures (e.g. agroforestry) to reduce input intensity (e.g. water) and environmental impacts</li> <li>🕒 Promote an integrated territorial and landscape approach for agricultural infrastructure investments to help improve agriculture resilience to extreme events and other climate impacts economic inefficiency and increasing progressivity</li> </ul>	<b>Development Benefits</b> ●●○	Human Capital ●●○ Growth ●●○ Conservation ●●●	
	<b>Climate Benefits</b> ●●○	Adaptation ●●● Mitigation ●●○	
	<b>Implementation Framework (Barriers)</b> ●○○	Policy and institutional frameworks ●○○ Political Economy ●●○ Financing ●○○	
<b>3.2 Land Use</b>			
<ul style="list-style-type: none"> <li>🕒 Advance the quantification of natural capital, implementation nature-based solutions, and estimate impacts to support improved resilience and risk reduction</li> <li>🕒 Continue to push forward the REDD+ agenda to support mitigation and ecosystem services through provision of support to implementing entities, provide technical training at all levels, and boost communication and benefit sharing</li> </ul>	<b>Development Benefits</b> ●●●	Human Capital ●●● Growth ●●● Conservation ●●●	
	<b>Climate Benefits</b> ●●●	Adaptation ●●● Mitigation ●●●	
	<b>Implementation Framework (Barriers)</b> ●○○	Policy and institutional frameworks ●○○ Political Economy ●○○ Financing ●○○	
<b>3.3 Water</b>			
<ul style="list-style-type: none"> <li>🕒 Increase reservoir volume through measures like raising dams and reducing sedimentation in order to increase supply availability</li> <li>🕒 Implement and expand water supply and sanitation modernization program to reduce losses, improve energy efficiency and improve service quality. In agriculture, increase the efficiency of irrigation to reduce unmet demand and build resilience</li> <li>🕒 Adopt and implement a law that would separate water regulatory functions from operations to ensure water resources can be adequately managed as the stressors from climate change increase</li> <li>🕒 Build and publicize the evidence base for the economic importance of water to raise awareness of the value of water to livelihoods and quality of life</li> <li>🕒 Strengthen the legal and regulatory framework for water service delivery (WSS, irrigation) through the establishment of an effective system of state issued water rights</li> </ul>	<b>Development Benefits</b> ●●○	Human Capital ●●○ Growth ●○○ Conservation ●●○	
	<b>Climate Benefits</b> ●●○	Adaptation ●●● Mitigation ●○○	
	<b>Implementation Framework (Barriers)</b> ●●○	Policy and institutional frameworks ●●○ Political Economy ●●○ Financing ●●●	

Policy Actions

Benefits & Barriers

4. Low Carbon Resilient Infrastructure

4.1 Energy

<ul style="list-style-type: none"> <li>🕒 Create an enabling environment for renewable energy integration by establishing policy, regulatory, and remuneration system to support battery adoption, implementing competitive procurement of RE, and coordinating with transmission planning</li> <li>🕒 Identify a technically, financially, socio-economically, and socially sound set of options to convert existing coal power to more efficient, lower-cost technologies</li> <li>🕒 Implement demonstration energy efficiency programs to reduce reliance on fossil fuels by strengthening the regulatory framework, and enforcing equipment, vehicle, and building performance standards</li> <li>🕒 Ensure the adequacy of the electricity grid to accommodate additional demand from large-scale adoption of electric vehicles</li> </ul>	Development Benefits ●●○	Human Capital ●●●	Growth ●●○	Conservation ●●○
	Climate Benefits ●●●	Adaptation ●●○	Mitigation ●●●	
	Implementation Framework (Barriers) ●●○	Policy and institutional frameworks ●●○	Political Economy ●●●	Financing ●●○

4.2 Transport

<ul style="list-style-type: none"> <li>🕒 Develop a clear roadmap for adoption of electric vehicles in urban transport (passenger and light freight)</li> <li>🕒 Build capacity and address challenges related to institutional coordination for delivery of urban transport projects and e-mobility transitions</li> <li>🕒 Support fleet renewal by incentivizing replacement of old vehicles and implementing stricter new and used vehicle standards particularly for heavy cargo transport</li> <li>🕒 Implement new mass transit modes, upgrade the public vehicle fleet with electric and hybrid units, and formalize informal transport providers (<i>conchos</i>) to improve public transportation options in urban areas</li> </ul>	Development Benefits ●●●	Human Capital ●●●	Growth ●●○	Conservation ●●●
	Climate Benefits ●●○	Adaptation ●●○	Mitigation ●●●	
	Implementation Framework (Barriers) ●●○	Policy and institutional frameworks ●●○	Political Economy ●●○	Financing ●●○

4.3 Disaster risk management

<ul style="list-style-type: none"> <li>🕒 Adopt building code standards and investments for multi-hazard risk to improve infrastructure and increase resilience to hazards.</li> <li>🕒 Improve the availability of data on natural hazards and risk exposure in order to support, land use planning, risk assessment and pricing of insurance products.</li> <li>🕒 Implement territorial planning reforms and incorporation of DRM in land use planning in order to reduce population vulnerability, environmental degradation, and cost of public service delivery.</li> <li>🕒 Assessment of investment opportunities in nature based solutions (range) for urban disaster resilience and tourism industry vitality (esp. mangroves and corals).</li> </ul>	Development Benefits ●●○	Human Capital ●●●	Growth ●●○	Conservation ●●○
	Climate Benefits ●●○	Adaptation ●●●	Mitigation ●●○	
	Implementation Framework (Barriers) ●●○	Policy and institutional frameworks ●●○	Political Economy ●●○	Financing ●●○

Policy Actions	Benefits & Barriers	
<b>5. Private Sector/Financial Sector Mobilization</b>		
<ul style="list-style-type: none"> <li>④ Deepening the financial markets, unleashing sustainable finance and leveraging PPPs.</li> <li>④ Fostering an inclusive financial sector, including savings, credit, and insurance, to previously underserved households and firms, while also promoting the development of more affordable microinsurance products for low-income households.</li> <li>④ Enhance infrastructure resilience and disaster risk financing by revamping risk management and investment strategies for tourism infrastructure. Integrate climate risk management within the emerging ESG framework.</li> <li>④ Emphasize the adoption of parametric insurance products, particularly for public services, industry, and agriculture, to mitigate the burden of contingent liabilities. Establish better contingent funds to manage disaster-related financial impacts.</li> </ul>	Development Benefits ●●○	Human Capital ●●○ Growth ●●● Conservation ●○○
	Climate Benefits ●●○	Adaptation ●●○ Mitigation ●○○
	Implementation Framework (Barriers) ●●○	Policy and institutional frameworks ●○○ Political Economy ●●○ Financing ●●○

Source: World Bank staff elaboration (2023).

**Climate objectives can be complementary to traditional development objectives if they are integrated into a consolidated development strategy.** The important additional investments and policy initiatives presented in this report will need to be balanced with the resources available for other sectoral and national priorities. Increasing spending on the decarbonization of the energy and transport sectors, agriculture, climate resilience, and water management, will most likely affect the budgets of other sectors such as health, education, and social assistance. Nevertheless, if correctly prioritized, adaptation and mitigation policy can be simultaneously good development policy, and climate objectives should be broadly mainstreamed into all sector objectives.

**Sequencing the proposed activities will be important for developing a strategic approach to enhancing climate action while at the same time meeting traditional development needs.** To optimize the available capacities and resources, this CCCR recommends focusing on a number of urgent priorities and cross-sectoral recommendations that create an enabling environment for sectoral recommendations in the short, and long term. At the same time, government, non government and private actors will need to leverage additional information and analysis at the investment level for a better understanding of the potential direct and indirect benefits of these investments, and the potential for cost savings in the future. This will enable decision makers to better prioritize among these recommendations.

**This CCCR highlights the benefits of a proactive fiscal policy that dedicates additional resources to climate adaptation, low carbon development, and disaster risk management.** This requires fiscal space which, in the medium term, could be created through additional revenue mobilization. In the short term, some additional debt financing could be justifiable. This approach would ensure that other key development objectives can be properly budgeted for without having to rely on *ad hoc* budget reallocations to finance emergency spending if a climate event should strike. Further, while a carbon tax could leverage significant resources, it could create a situation of winners and losers. Therefore, carbon charges need to be designed considering the distributional aspects of these policies, and supported by complementary measures for infrastructure, social protection, public transport, health, and education. These compensatory measures could address the distributional aspects of a carbon tax and at same time offer broad co-benefits to society. Further analytical work should guide the design of carbon pricing.

**This report serves as an entry point for dialogue on the multiple challenges the country needs to address to ensure that a climate resilient and low carbon trajectory is possible.** The challenges of implementing policies that will support these objectives should not be underestimated, but making progress would yield economic benefits, improve productivity, and conserve DR's natural capital. Tackling them effectively will require a strong strategic vision, close policy coordination, and the building of government capacities. The DR has many opportunities, from its diversity to its economic capabilities, its ingenuity, and its exceptional natural resources. In light of this, there is substantial room for Dominicans to build the future they desire and ensure that it is bright, equitable, productive, and climate-resilient.





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