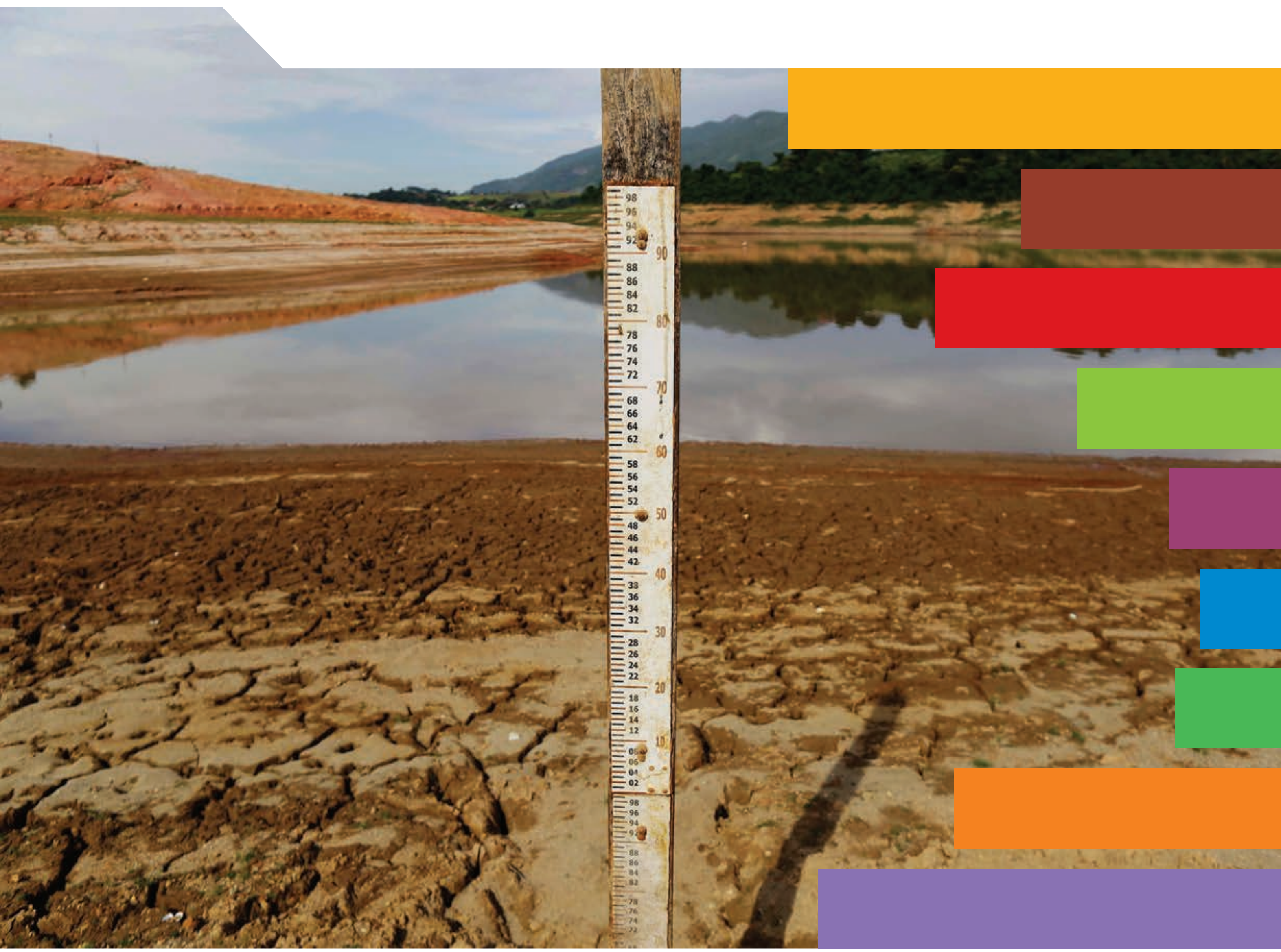
Environment at a Glance in Latin America and the Caribbean

SPOTLIGHT ON CLIMATE CHANGE



OECD

Environment at a Glance in Latin America and the Caribbean

SPOTLIGHT ON CLIMATE CHANGE

BETTER POLICIES FOR BETTER LIVES

Please cite this publication as:
OECD (2023), *Environment at a Glance in Latin America and the Caribbean: Spotlight on Climate Change*, OECD Publishing, Paris, https://doi.org/10.1787/2431bd6c-en.

ISBN 978-92-64-99592-5 (pdf)
ISBN 978-92-64-66727-3 (HTML)

Photo credits: Cover © Shutterstock.com/Nelson Antoine.

Corrigenda to OECD publications may be found on line at: www.oecd.org/about/publishing/corrigenda.htm.

Preface

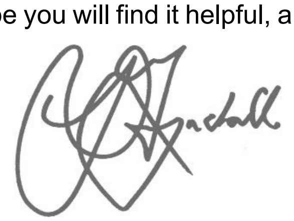
Environment at a Glance in Latin America and the Caribbean: Spotlight on climate change presents the progress made by countries in the region in reducing greenhouse gas emissions, improving air quality and protecting natural habitats. It describes the level of exposure to climate-related hazards and some of the main policy instruments used to address climate change. It reveals where progress is still insufficient and where better data are needed.

Latin America and the Caribbean is a region of great importance to global biodiversity. It spans two hemispheres, three oceans (Pacific, Atlantic, Antarctic) and a multitude of ecosystems with climatic conditions ranging from tropical, to temperate, and arid. The region is also of growing importance to the world economy, but one of the world's most vulnerable to the effects of climate change. Although not being a major contributor to global greenhouse gas emissions, rising temperatures, fluctuating rainfall patterns and the increased occurrence of extreme weather events associated with land use change, urban sprawl and deforestation, exert strong pressures on the environment, causing biodiversity loss and affecting economic activity and people's livelihood. The challenges posed by climate change are immense and public pressure for action on climate and other environmental issues is mounting.

I see substantial scope for strengthening climate mitigation and adaptation policies and making policies more coherent, while at the same time preserving biodiversity and natural resources, improving people's livelihood, reinforcing institutions and enhancing regional and multilateral co-operation – all critical components of a green transition.

To be effective, policies need to be based on sound and reliable information. The preparation of this report revealed substantial gaps in data on the environment and climate change in the region. Part of the OECD's core business is to work closely with countries to improve the quality of information on the environment and sustainable development. Drawing on our expertise with respect to environmental information and indicators as well as environmental country reviews, and on the work of the International Programme for Action on Climate, we can support countries in monitoring their progress, improving their environmental information systems, and producing reliable and coherent indicators.

The OECD also provides governments and the wider public with internationally harmonised data and indicators on the environment. Developing this interactive report and the accompanying dashboard has been a great innovation. I very much hope you will find it helpful, and look forward to getting your feedback.



Jo Tyndall

Environment Director

OECD

Foreword

This report is part of the OECD project "Enhancing Green Transition in Latin America and the Caribbean (LAC): From Commitments to Action", which implements the Environmental Sustainability pillar of the OECD Latin America and the Caribbean Regional Programme. The project aims to analyse recent trends and progress as well as the challenges and opportunities of the green transition in LAC.

The report draws, inter alia, on the OECD's long-standing experience in environmental data and indicators, as well as on the Programme on Environmental Information and Indicators and the International Programme for Action on Climate (IPAC).

The OECD Programme on Environmental Information and Indicators is steered by the Working Party on Environmental Information (WPEI) of the OECD Environment Policy Committee (EPOC). The aim of this programme is to develop objective, reliable and comparable information on the environment and sustainable development for use in international work, and to support countries in their efforts to improve environmental information systems and establish effective mechanisms to inform the public and decision makers. IPAC was launched at the 2021 OECD Ministerial Council Meeting as part of the Horizontal Project on Building Climate and Economic Resilience. It responds to countries' need for up-to-date, comparable and comprehensive indicators to support climate policy-making. It has developed an extensive set of indicators for a group of 51 countries and will gradually extend coverage.

This report focuses on climate change in the LAC region. It uses the latest comparable data from OECD and IEA databases available on the OECD statistical platform OECD.stat. They build on data provided regularly by member countries through questionnaires and direct inputs into OECD databases, and on data available from other official OECD and international sources (e.g. FAO, UNFCCC, EMEP, UNEP-WCMC, WRI). The project helped identify a number of substantial gaps in key data and indicators. The OECD stands ready to work together with the LAC countries and regional partners to advance measurement and improve national information systems.

The report was prepared by Rodrigo Pizarro, Amy Cano Prentice, Myriam Linster and Sarah Miet with technical support from Abenezer Aklilu, Luisa Lutz, Svenja Seeber, and Pinhas Zamorano of the Environment Directorate. Nathalie Girouard, Head of the OECD Environmental Performance and Information Division, provided oversight and guidance. Natasha Cline-Thomas provided communications support. The authors are grateful to colleagues from the Public Affairs and Communications Directorate who provided technical support for the establishment of interactive graphics including Jonathan Dayot, Claudia Tromboni, Carmen Fernandez Biezma, Bertrand Rivière and Frédéric Lamoitte. The authors thank Sergio Ampudia Giorgana, Eija Kiiskinen, and Dimitra Xynou from the Finance, Investment and Global Relations Division of the OECD Environment Directorate for their valuable support. Special thanks are extended to Rodolfo Lacy for spearheading the expansion of Environment at a Glance to the LAC. This report was produced with the financial assistance of the European Union Facility for Development in Transition. The views herein can in no way be taken to reflect the official position of the European Union nor its Member States.

Table of contents

Tables

Figures

Boxes

Reader's guide

This report presents a digest of selected environmental trends in LAC countries with a focus on climate change, and its interconnection with air quality and biodiversity. Particular attention is given to emission trends, mitigation needs, climate-related hazards, and policy instruments for climate.

The analysis and key messages are based on indicators from the OECD Core Set of Environmental Indicators – a tool to monitor environmental progress and performance and to track the course towards sustainable development – and on indicators to monitor progress towards climate objectives. Most of these indicators are available on the interactive Environment at a Glance web-platform and in the IPAC Dashboard.

Box 1. The "Environment at a Glance" interactive web platform: a gateway to OECD indicators

The Environment at a Glance platform provides an interactive access to OECD environmental indicators and to the latest data on the environment received from OECD members and compiled from international sources. It highlights major environmental trends in areas such as climate change, biodiversity, water resources, air quality, circular economy and ocean. Users can access the indicators updated in real-time from OECD databases, play with the data and graphics, and consult and download thematic webbooks and country profiles. The topics covered and the indicators provided will be progressively expanded so as to provide a user-friendly gateway to OECD indicators on the environment, green growth and sustainable development: http://oe.cd/env-glance.

The Latin America and Caribbean region

The following countries and dependent territories are considered in this report, grouped under three sub-regions: South America, Central America and the Caribbean. Depending on the availability of data, regional and sub-regional averages may not always have the same country coverage across indicators.

List of LAC countries

Caribbean		Central America		South America	
AIA	Anguilla (GBR)	BLZ	Belize	ARG	Argentina
ATG	Antigua and Barbuda	CRI	Costa Rica	BOL	Bolivia
ABW	Aruba (NLD)	SVD OR SLV	El Salvador	BRA	Brazil
BHS	Bahamas	GTM	Guatemala	CHL	Chile
BLM	Saint Barthélemy (FRA)	HND	Honduras	COL	Colombia
BRB	Barbados	MEX	Mexico	ECU	Ecuador
CUB	Cuba	NIC	Nicaragua	GUF	French Guiana
CUW	Curaçao (NDL)	PAN	Panama	GUY	Guyana
CYM	Cayman Islands (GBR)			PRY	Paraguay
DMA	Dominica			PER	Peru
DOM	Dominican Republic			SUR	Suriname
GRD	Grenada			URY	Uruguay
GLP	Guadeloupe (FRA)			VEN	Venezuela
HTI	Haiti				
JAM	Jamaica				
KNA	St. Kitts and Nevis				
LCA	St. Lucia				
MAF	Saint Martin (FRA)				
MSR	Montserrat (GBR)				
MTQ	Martinique (FRA)				
PRI	Puerto Rico (USA)				
SXM	Sint Maarten (NDL)				
TTO	Trinidad and Tobago				
TCA	Turks and Caicos Islands				
VCT	St. Vincent and the Grenadines				
VGB	British Virgin Islands (GBR)				
VIR	U.S. Virgin Islands (USA)				

Data availability

The preparation of this webbook has underscored the urgent need for more and better data on the environment and sustainable development in the region. There are major gaps in statistics and data on key issues, and many data quality issues, in particular as regards:

1. GHG emissions and related trends
2. Clarity on emissions targets
3. Climate-related hazards
4. Environment and climate-related policy instruments

Comparability and interpretation

The indicators used in this report are of varying relevance for different countries. Care should be taken when interpreting the indicators and when making international comparisons. Issues to be considered include:

- National averages can mask variations within countries. This is particularly relevant given the large differences in scale across countries. Definitions and measurement methods vary among countries, hence inter-country comparisons may not compare the same things.
- There is a level of uncertainty associated with the data sources and measurement methods on which the indicators rely. Differences between two countries' indicators are thus not always

statistically significant; and when countries are clustered around a relatively narrow range of outcomes, it may be misleading to establish an order of ranking.

- For some indicators, showing the direction and magnitude of change over time for a given country is more meaningful than cross-country comparisons, and trends in the indicators' value are more important than their absolute value.
- No single approach has been used for normalising the indicators; different denominators are used in parallel to balance the message conveyed. Many indicators are expressed on a per-capita and per-unit-of-GDP basis. The population estimates used include persons who are resident in a country for one year or more, regardless of their citizenship. The GDP figures used are expressed in USD, at 2015 prices and purchasing power parities (PPPs). Definitions and metadata can be found in the webbooks available at http://oe.cd/env-glance and in the glossary at the end of this report.

For each topic, a section on comparability and interpretation provides further detail.

Cut-off date

The indicators build on the latest available data from OECD and other international sources up to April 2023. The period under review for the herein data is from 1979 to 2023. Data on climate hazards is available from 1979, data on environmentally related tax revenue is available from 1994, and data for GHG emissions, air pollution, energy use, land use and socio-economic indicators is available from 1990. Data on climate tagged aid is available from 2002, data on climate policy instruments is available from 2015, and data on Net Effective Carbon Rates from 2018. Some indicators draw on recent work carried out under the International Programme for Action on Climate.

List of abbreviations

CAPMF	Climate Actions and Policies Measurement Framework	LULUCF	Land Use, Land Use Change and Forestry
CBD	Convention on Biological Diversity	NASA	National Aeronautics and Space Administration
CDS	Copernicus Climate Data Store	NbS	Nature-based solutions
CO_2	Carbon dioxide	NDC	Nationally Determined Contribution
CO_2e	Carbon dioxide equivalent	NO_x	Nitrogen oxides
COP	Conference of Parties	PA	Paris Agreement
DAC	Development Assistance Committee	PINE	Policy Instruments for the Environment (database)
ECR	Effective carbon rate	$PM_{2.5}$	Fine particulate matter
ESG	Environmental, Social and Governance	PPPs	Purchasing Power Parities
ETS	Emission trading systems	SLCF	Short-lived climate forcers
GBF	Global Biodiversity Framework	SO_x	Sulphur oxides
GDP	Gross domestic product	TES	Total energy supply
GHG	Greenhouse gas emissions	UNCED	United Nations Conference on Environment and Development
GSSS	Green, social, sustainable and sustainability-linked	UNEP-WCMC	UN Environment World Conservation Monitoring Centre
IEA	International Energy Agency	UNFCCC	United Nations Framework Convention on Climate Change
IPAC	International Programme for Action on Climate	UTCI	Universal Thermal Climate Index
IPCC	Intergovernmental Panel on Climate Change	WDPA	World Database on Protected Areas
IUCN	International Union for the Conservation of Nature	WHO	World Health Organisation
LAC	Latin America and the Caribbean	WRI	World Resource Institute
LTS	Long-Term Strategies		

Executive summary

Latin America and the Caribbean is composed of 48 countries and dependent territories with varying geographical conditions, land use patterns, political systems, economic activities and development levels. The region has a diverse cultural and ethnic heritage, with a common identity. Natural resources and biodiversity are the pillars of the region's development, and countries face significant environmental challenges.

The LAC region has a diverse and open economy. Agriculture and industry account for a larger share of value added than in the OECD area. As the region is endowed with valuable mineral resources and significant oil and natural gas deposits, mining and energy are major sectors. Tourism plays a significant role in Central America and the Caribbean. Most countries have been severely affected by the COVID-19 pandemic and the global economic downturn. Gross domestic product plunged by 8.2% in 2020 and the region experienced one of the highest mortality rates in the world, due to the high concentration of population in urban areas and unequal access to health services. High levels of poverty and income inequality are major issues.

Though not a major contributor to global greenhouse gas emissions, LAC is extremely vulnerable to climate change. Land use change, urban sprawl and densification, rising temperatures, fluctuating rainfall patterns, melting glaciers, and the increased occurrence of extreme weather events exert strong pressures on the environment, causing biodiversity loss and affecting economic activity and people's livelihood. Governments of the region will have to step up their efforts to address the growing risks posed by climate change and implement more ambitious and effective policies to achieve a green transition of their economies.

LAC countries are not major contributors to global greenhouse gas emissions…

Gross GHG emissions in LAC represented around 6.7% of global emissions in 2019, which is proportional to the region's share in global GDP and slightly lower than its share in global population. Emissions per capita are lower than in the OECD area, though intensities vary widely across countries. This reflects lower income and consumption levels and a high share of renewables in electricity production, mainly hydropower. Emissions have risen between 1990 and 2019, driven by increased transport activities and electricity and heat production, which continue to rely on fossil fuels. From 2014, they grew at a slower pace than economic growth suggesting a relative decoupling.

Most GHG are emitted in South America (71%), followed by Central America (24%) and the Caribbean (4%). Emissions from agriculture and from land use, land use change and forestry play an important role. In South America they account for a third and a fourth of net emissions, respectively. This reflects the importance of agriculture in the economy and the extensive deforestation occurring in the sub-region. In Central America and the Caribbean, energy production and transport are major emitters.

But vulnerability to climate risks is high

Due to its reliance on natural resources and ecosystem services, its geographic configuration, and high inequalities and levels of poverty, LAC is one of the most vulnerable regions in the world to climate change. Out of the 50 countries most affected by climate change worldwide, 13 are in the region.

Climate change impacts are already challenging the fiscal sustainability of the region when natural disasters strike; in the longer term key economic sectors such as agriculture, forestry, tourism and hydropower production will be increasingly affected.

The population in the region is increasingly exposed to heat stress. The surface temperature in 2019-21 was on average 0.6°C higher than in 1981-2010. Temperature increases were larger in Central America and more modest in the Caribbean. The country most affected is Paraguay with nearly 90% of its population exposed to more than 2 weeks of hot summer days, compared to only 28% in 1979. Increasing temperatures combined with extreme rainfall pose significant risks for countries that depend on agricultural production. Droughts are becoming more frequent, resulting in significant decreases in soil moisture on agricultural land. Countries such as Peru, Chile, Argentina and Mexico experience a decrease of up to 40% in soil moisture on cropland. These developments heavily impact agricultural productivity and raise concerns over food security.

Wildfires are also expected to occur more frequently. Almost a third of LAC forest areas is exposed to wildfire risks, which presents a danger for populations and ecosystems. In Jamaica, Paraguay, Mexico and El Salvador over 70% of the forest area is exposed to wildfire risks. Rising sea levels are another critical hazard in the region. Twenty-three of the 33 LAC countries (i.e. excluding dependent territories) have a marine territory larger than their land territory; for 18 countries the maritime area exceeds 75% of the total territory. The impact of sea level rise on coastal populations and tourism could thus be significant.

Threats to human health and biodiversity are major concerns

LAC countries face other pressing environmental challenges, such as local air pollution and biodiversity loss, which exacerbate climate change vulnerabilities.

GHGs are often emitted from the same sources as air pollutants such as fine particulates ($PM_{2.5}$) that include black carbon, a short-lived climate forcer, and pose severe environmental health risks in the region. Population exposure to $PM_{2.5}$ has been slowly decreasing over the past few decades, but annual exposure levels (18 $\mu g/m^3$ in 2019) remain significantly above the World Health Organisation guideline (5 $\mu g/m^3$). Exposure is particularly high in large urban areas where economic activity is concentrated and demand for mobility highest. The welfare costs associated with related mortality and morbidity were estimated at 2.8% of the region's GDP in 2019. A strengthening of local air pollution policies would help mitigate GHGs while at the same time improving air quality and human health.

LAC has the highest biological diversity in the world. Forests and green corridors, such as the Mesoamerican Biological Corridor, play an essential role in carbon sequestration globally. However, deforestation, pollution, overexploitation and illegal trafficking of species, and urban sprawl and densification exert continued pressures on the natural environment, causing habitat loss and fragmentation, and a degradation of ecosystem services. Biodiversity as measured by the Red List Index is declining at twice the rate observed across OECD countries. This in turn undermines the ability of ecosystems to provide a shield against growing climate-related risks and reduces their resilience to impacts of climate change.

The region progressed in taking measures to protect its biodiversity and landscapes. In 2022, it had 24% of its land area and 21% of its Exclusive Economic Zones, designated as terrestrial and marine protected areas, respectively. Although many of these areas are designated under the least stringent protection objectives, the region as a whole achieved the 2020 Aichi targets. Further efforts are needed to reach the

Global Biodiversity Framework target of the CBD to effectively conserve and manage 30% of the national territory including terrestrial, inland water, and coastal and marine areas by 2030.

Climate objectives are not ambitious enough

LAC countries lag behind regarding formal commitments to reduce GHG emissions in line with the Paris Agreement, but ambition is increasing. By the end of 2022, the 33 LAC countries (excluding dependent territories) had submitted their nationally determined contributions under the Paris Agreement. However, only 20 of these NDCs are clear enough to infer targets for 2030 and beyond, and only six cover all GHG. 16 countries committed to net zero by 2050 or earlier. Furthermore, tracking progress towards climate objectives is hampered by the limited availability of GHG emission data. Most LAC countries do not produce regular, official and comprehensive GHG emission inventories.

Stronger policies are needed to effectively address climate change

Data from the OECD for seven LAC countries suggest that, since the adoption of the Paris Agreement in 2015, LAC countries strengthened their climate action in terms of both policy adoption and policy stringency.

Some countries primarily rely on market-based policies such as carbon pricing and subsidies, and feed-in tariffs for renewable energy (e.g. Mexico, Colombia, Chile and Argentina). Others rely primarily on non-market-based instruments such as minimum energy performance standards and bans or phase-outs of fossil-fuel equipment or infrastructure (e.g. Costa Rica and Peru). Despite progress, climate policies and actions remain insufficient. There is much room for enhancing the effectiveness of countries' policy mixes and strengthening policy stringency.

LAC countries increasingly use environmentally related taxation and carbon pricing mainly through fuel excise duties, but also through explicit carbon taxes. Carbon pricing is most commonly implemented in the transport sector, followed by agriculture and fisheries. These are positive developments, but the revenue raised is modest and effective carbon rates remain too low to effectively incentivise emission reductions. This points at an untapped revenue potential. In addition, governments of LAC countries continue to support fossil fuels. Although government support decreased between 2012 and 2019 (-32%), it more than doubled in 2021 with the rebound of the global economy. It is expected to further increase as global consumption subsidies are anticipated to skyrocket in 2022, due to higher fuel prices and energy use.

Progressively increasing carbon taxes while reforming fossil fuel support could help LAC countries implement the necessary incentives to reduce carbon emissions and free financial resources for social spending.

Countries must choose the best policy mix and instruments for effective climate action in the context of their policy landscape and principal drivers of emissions. Governments must align their climate objectives across policy domains including transport, housing, construction, spatial planning, agriculture and development co-operation. They must also consider the synergies between emission reduction and adaptation strategies, as well as other environmental and broader well-being objectives, such as biodiversity conservation, cleaner air and improved health. A whole-of-government approach integrating climate policies with actions to improve productivity and reduce poverty and vulnerability are particularly important in the LAC region.

Better information is needed to support the implementation of effective policies

The preparation of this report revealed substantial information gaps that hamper the implementation of effective and coherent policies on climate change and the environment in LAC. For example, most LAC countries do not produce regular and comprehensive GHG emission inventories. This is a major impediment to assess trends and progress in mitigation efforts. Moreover, comprehensive and detailed data on climate-related risks – essential to develop and focus adaptation policies – are missing.

The governments of the region need to further invest in the development and upgrading of their national environmental information systems, including the production of sound and reliable data and indicators on climate, the environment and sustainable development. There is considerable scope in developing national statistical and monitoring capacities, including through improved institutional co-ordination and enhanced regional and multilateral co-operation.

Introduction - Latin America and the Caribbean

Latin America and the Caribbean (hereafter "LAC") is composed of 48 separate administrative units including 33 countries and 15 dependent territories with various governance and political systems. The region spans approximately 20 million square kilometres (km^2), about 15% of the global land area (FAO, 2023[1]). It covers two hemispheres, three oceans and a multitude of ecosystems.

With 660 million inhabitants of European, African, Asian and Indigenous descent (about 8.3% of the world's population), the region boasts a diverse cultural and ethnic heritage (ECLAC, 2022[2]). Shared cultural understandings and a close link to the environment have built a common identity.

Economic development and social wellbeing are closely connected to the natural environment and the resources and ecosystem services it provides. The region is highly vulnerable to climate change that affects the lives and livelihoods of millions of people. Governments of LAC countries need to mitigate emissions while ensuring the climate transition considers the most vulnerable population groups and the protection and sustainable management of ecosystems.

Economic development

In 2021, the economy of the LAC region represented about 7% of global gross domestic product (GDP) (OECD, 2023[3]). Most LAC countries were severely affected by the COVID-19 pandemic and the global economic downturn. GDP plunged by 8.2% in 2020, compared to a decrease of 4.2% in the OECD and 3.2% globally (IMF, 2023[4]).[1] High energy prices, repercussions of the economic slowdown in China, a key trading partner of the region, and structural issues affect growth prospects; the region is not expected to resume the high levels of economic growth experienced in the 2000s.

The socio-economic consequences of COVID-19 linger, with high levels of poverty and income inequality (OECD et al., 2022[5]). Income levels vary considerably across countries, with Chile, Panama and some Caribbean islands having the highest income levels, and Nicaragua, Honduras and Haiti the lowest. In 2021, average GDP per capita was USD 17 383, less than half the OECD average of USD 43 115 (at 2015 prices and PPP) (Figure 1) (OECD, 2023[3]).

The region's economy is largely based on activities that use and process natural resources. In 2020, industry[2] contributed to 27.7% of value added, compared to an OECD average of 23.9% (OECD, 2023[6]). Manufacturing industries alone accounted for 13% of the LAC region's GDP (CEPALSTAT, 2023[7]). Automotive and electronics industries (such as large-scale solar panels and televisions) play a key role in large countries such as Brazil and Mexico – the latter having a significant maquila industry associated with the North American Free Trade Agreement and other trade arrangements across Central America.

Mining and energy are important sectors, as the region is endowed with valuable mineral resources and significant oil and natural gas deposits. Venezuela alone owns 24% of the world's oil reserves (OPEC, 2022[8]) and around 4% of global natural gas reserves (US EIA, 2023[9]). Nevertheless, hydropower is the main source for electricity in the region (54% in 2020) (IEA, 2022[10]). The region has an important copper and lithium production, more than a quarter of the world's lithium production, with Chile accounting for 26% of the total global mine production in 2020 (USGS, 2022[11]).

Agriculture accounts for a larger share of value added (6.6%) than in OECD countries (1.8%) (OECD, 2023[6]). Fertile soils and mild climates have made it a major economic and social activity. The region's cash crops include coffee and cacao, as well as industrial crops such as corn, soya and wheat. Grazing animals such a sheep, llamas, alpacas, and vicuñas are bred for meat and for wool that is used in high quality textiles exported worldwide. The Pampa's vast pastures feed South America's livestock. Due to the Humboldt current coming from Antarctica, fisheries are an important economic activity along LAC's Pacific coast and many coastal communities rely on subsistence fisheries. Catch volumes are, however, declining due to over-fishing and unsustainable resource management that led to the depletion of many fish populations. Forestry is a major economic activity in the Amazon River basin and the south of Chile, which is an important exporter of wood chips, plywood and paper pulp. Timber production from naturally regenerating forests (non-cultivated timber extraction) is increasing as a source of income growth in several countries such as Brazil and Chile.

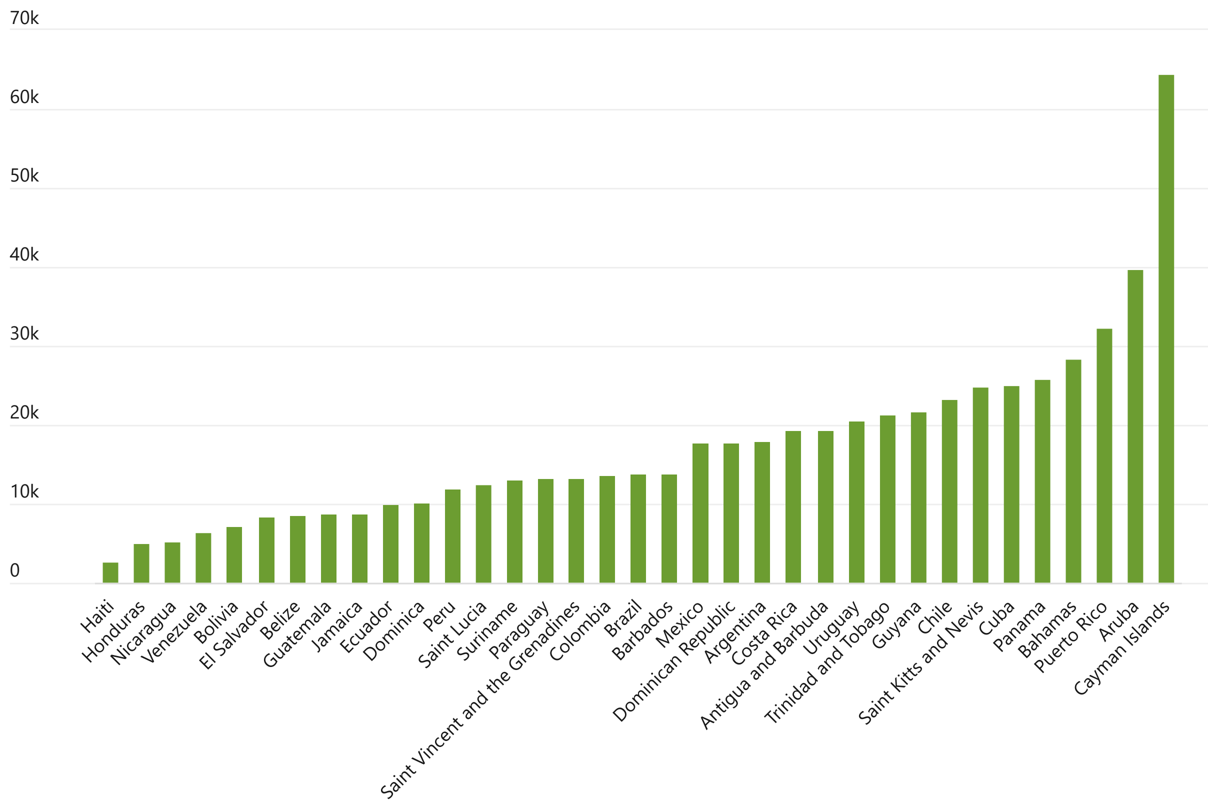
Trade plays an important role with exports and imports accounting for 27% and 28% of GDP respectively in 2021. Main exports include petroleum, ores, soya beans and motor vehicles, that together account for more than a fourth of total exports. Main imports are intermediate goods (65%). This reflects the region's strong industrial base that is however concentred in a few large countries (CEPALSTAT, 2023[7]).

Tourism generates significant income, particularly in Central America and the Caribbean. In 2018, inbound tourism expenditure contributed to more than half of GDP in Caribbean islands such as Turks and Caicos (77%), Aruba (72%), Antigua and Barbuda (60%), Montserrat (55%) and Saint Lucia (51%). In Central America, the highest shares are found in Belize (25%), followed by Panama (11%), Costa Rica (6%), El Salvador (5%) and Nicaragua (4%). South America derives less than 5% of its GDP from tourism (CEPALSTAT / WTO, 2022[12]).

Most LAC countries base their economic development on natural resources or ecosystem services. Therefore, the region is particularly vulnerable to climate change. Impacts associated with climate-related hazards will have serious consequences for activities such as agriculture, tourism, forestry, fisheries and hydroelectric capacity. Furthermore, given the high dependence of some economies on fossil fuels and manufacturing, the expected energy transition will also have a significant impact, particularly in countries such as Venezuela, Ecuador and Colombia, that are dependent on fossil fuel exports, and in Central American countries that are dependent on the maquila industry.

Figure 1. Gross Domestic Product per capita

Real GDP, in USD at 2015 prices and PPPs



Compare: [Link to the dashboard](#).
Source: OECD, "Green growth indicators", OECD Environment Statistics (database), https://doi.org/10.1787/data-00665-en.

Social conditions

The population of LAC is predominantly urban (81% in 2020). In South America 85% of the population lives in urban areas, followed by Central America (75%) and the Caribbean (67%) (CEPALSTAT, 2023[7]). Population density is highest in the Caribbean with an average 300 inhabitants per km^2 in 2021; it is much lower in Central America's (106 inhab/km^2) and very low in South America (25 inhab/km^2) although this masks a high population concentration in big cities (Figure 2). The high urbanisation rate generates considerable environmental challenges. Many people live in urban centres where air pollution is concentrated, and islands with high population density are more exposed to climate-related hazards.

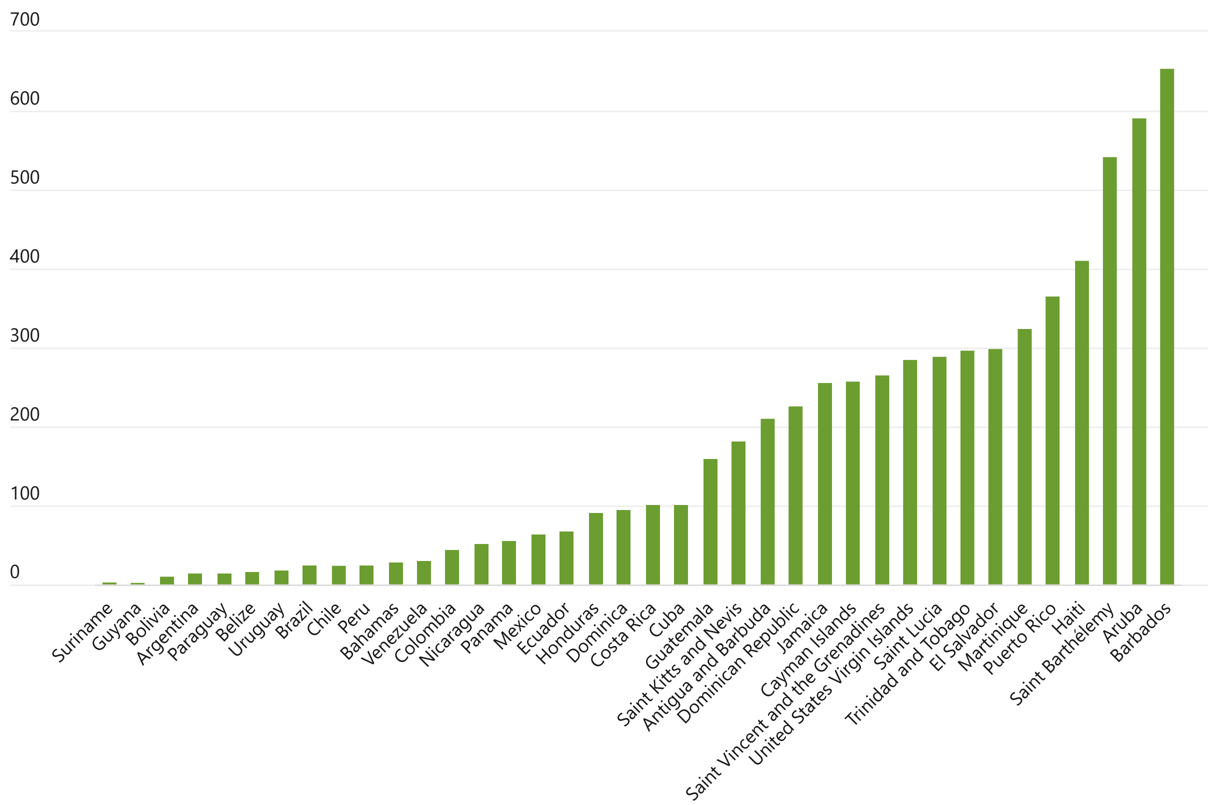
Income inequality and urban-rural disparities have been historically high. Income inequality quantified by the Gini coefficient averaged 0.46 in 2021 in LAC, (CEPALSTAT, 2023[7]) compared to an OECD average of 0.34 (OECD, 2023[13]).[3] Differences across countries are considerable; the Gini coefficient ranges from 0.40 in the Dominican Republic and Uruguay to 0.54 in Brazil (CEPALSTAT, 2023[7]).

Poverty is a major concern, particularly in urban areas. About 32% of the urban population lived in extreme poverty in 2021, compared to 13% of the rural population (CEPALSTAT, 2023[7]). While this gap has narrowed since the early 2000s, little progress was made in the past decade and the economic crisis following the pandemic has aggravated the situation.

During the COVID-19 pandemic, the region experienced one of the highest mortality rates in the world due to the high population concentration in urban areas and unequal access to health services. Brazil, Peru and Ecuador were especially affected. The region lost 2.9 years of life expectancy at birth between 2019 and 2021 (CEPALSTAT, 2023[7]). The vulnerability of the region's health systems and the high public debt –on average 65% of GDP in 2020 and over 100% in some countries (CEPALSTAT, 2023[7]) – limit its capacity to deal effectively with the impacts of climate change that are likely to affect large vulnerable groups of the population.

Figure 2. Population density

Inhabitants per km^2, 2021



Compare: Link to the dashboard.
Source: OECD, "Green growth indicators", OECD Environment Statistics (database), https://doi.org/10.1787/data-00665-en.

Geography and land use

LAC has a wide variety of climatic conditions, ranging from tropical, to temperate, and arid. This is due to differences in elevation across the region – from lowlands in Mexico and Brazil, to Andean peaks just under 7 000 metres – and the impact of warm currents from the Atlantic Ocean and cold currents from the Pacific Ocean. This varied climate and physical geography facilitates a range of biomes and ecosystems, including close to 4 million hectares of permanent snow and glaciers, over 4 million hectares of mangroves, and over 70 million hectares of Ramsar-designated wetlands (CEPALSTAT, 2023[7]). It makes the region the home of about 50% of the world's biodiversity and one-third of global freshwater resources (OECD et al., 2022[5]). According to the UN Environment World Conservation Monitoring Centre (UNEP-WCMC) six Latin

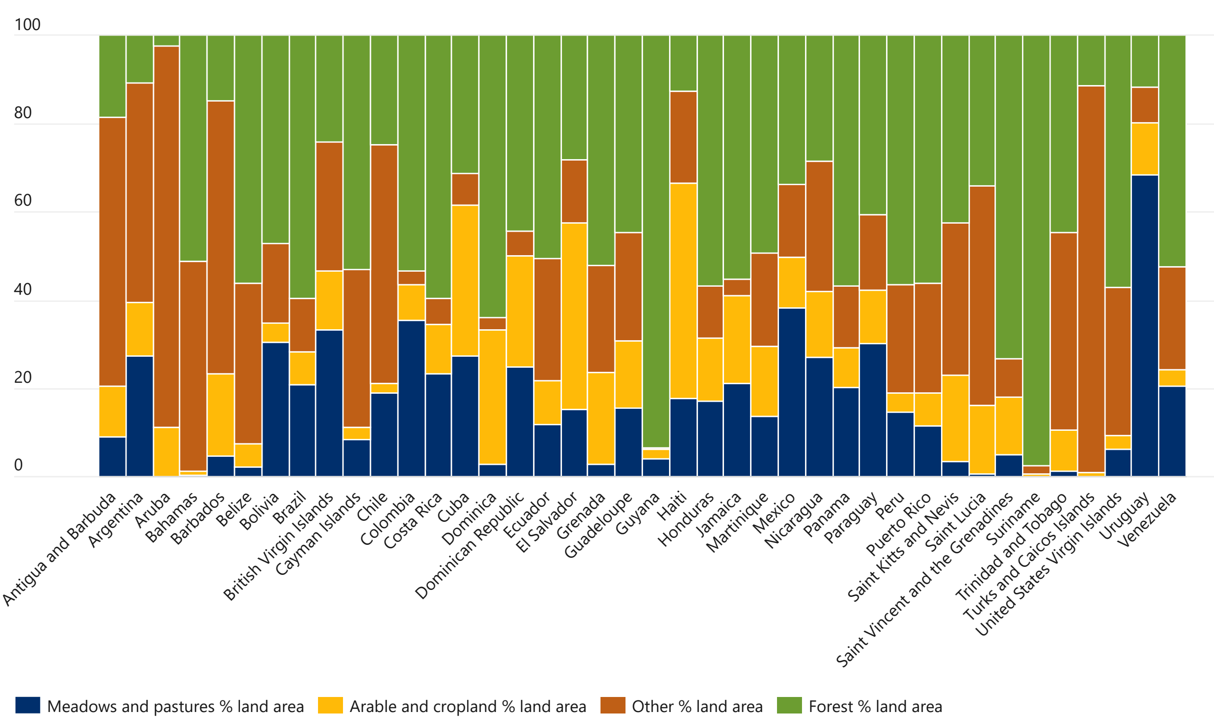
American countries are considered to be mega-diverse (out of 17 in the world), namely Brazil, Colombia, Ecuador, Mexico, Peru and Venezuela.

LAC is home to 23% of the world's forests, including the Amazon, the world's largest rain forest which is shared by eight countries. South America has the largest forest cover (48% of its land area in 2020) (OECD, 2023[14]), owing to countries such as Suriname, Guyana, Brazil, Peru, Colombia, Venezuela and Ecuador, where forests cover more than half of the land area. In Central America forests represent 36% of the land area and in the Caribbean 35% (Figure 3). Many high-value tree species, such as mahogany and rosewood, are native to the rainforest. However, forests are under threat. Between 1990 and 2020, the proportion of regional forest cover decreased from 53% to 46% of total territory (CEPALSTAT, 2023[7]). With the exception of Chile and Costa Rica, all LAC countries have suffered a significant net loss in forested areas.

Agricultural land, including meadows and pastures, arable land and permanent crops, spans over 650 million hectares. Brazil has the largest area in absolute terms (over 236 million hectares). The area of arable and cropland varies across sub regions. It covers 30% of the land in the Caribbean, 12% in Central America and 8% in South America. Countries with the highest share of agricultural land include Uruguay, Haiti, Cuba, El Salvador, the Dominican Republic and Mexico (Figure 3). Organic agriculture has developed across the region over the past 15 years. Countries with high proportions of agricultural area under organic farming include Uruguay (20% in 2020), French Guiana (11%), Dominican Republic (5%) and Argentina (4%) (CEPALSTAT, 2023[7]). Land use policies need to consider the role that agricultural systems play as an important source of income, employment and food for the region and the world (ECLAC, 2021[15]).

Figure 3. Land Use

Percentage of total land area



Compare: Link to the dashboard.
Source: OECD, "Land resources: Land use", OECD Environment Statistics (database), https://doi.org/10.1787/8ecc9c9c-en.

Vulnerability to climate change

Due to its reliance on natural resources and ecosystem services, high inequalities and levels of poverty, LAC is one of the most vulnerable regions in the world to climate change. The region's economy and the population's well-being are affected either directly, through the exposure to changing climate and climate-related hazards, or indirectly, through the impacts on economic activities associated with the energy transition. Rising temperatures, fluctuating rainfall patterns, melting glaciers, and the increased occurrence of extreme weather events pose risks to the Latin American hydroelectric power system. Increasing temperatures and droughts exert pressures on the agricultural sector and forestry activities, and increase wildfire risks. Many tourist areas will be affected by rising sea levels and climate-related hazards.

Climate change impacts are already challenging the fiscal sustainability of the region when natural disasters strike; in the longer term, key economic sectors will be increasingly affected. Domestic and international policies to mitigate climate change through reduced fossil fuel consumption may also reduce the region's financial resources, many LAC countries being major exporters of fossil fuel and agricultural products.

The transition to less carbon intensive economies also creates opportunities, generating new economic activities. Growing demands for renewable energy sources, lithium and copper and other key minerals, as well as the potential to implement nature-based solutions suggests that structural changes could help the region move towards a more sustainable, resilient and inclusive development model (EUROCLIMA, 2022[16]). This model should help close the existing social, economic, institutional and environmental development gaps and avoid generating new ones.

Climate change mitigation

Key messages

- LAC countries lag on formal commitments to reduce GHG emissions in line with the Paris Agreement, but levels of ambition are rising. By the end of 2022, all 33 countries had submitted their Nationally Determined Contributions to the UNFCCC. However, only 20 of these contributions are clear enough to infer targets for 2030 and beyond; only six cover all GHGs. 16 countries committed to net zero by 2050 or earlier.
- In 2019, the LAC region contributed about 6.7% of global gross GHG emissions.[4] Since1990 gross emissions have grown by 61%, driven by increased transport activities and electricity and heat production. From 2014, emissions grew at a slower pace than GDP and even decreased, suggesting a relative decoupling from economic growth.
- Transport is a major emission source due to the large size of many LAC countries, high motorisation rates and fossil fuel driven motor vehicle fleets. In 2020, an inhabitant of LAC emitted on average 2 tonnes of energy-related CO_2, much less than the OECD average of 7.5 tonnes. This partly reflects lower income and consumption levels and a less carbon intensive energy mix.
- A more nuanced picture emerges when considering emissions from agriculture, forestry and land use change. These sources play an important role in the region, accounting for 26% and 20% of net emissions, respectively. They are driven by cattle raising, extensive agriculture and deforestation.
- Energy supply remains dominated by fossil fuels (69% in 2020), although renewables account for a much larger share (30%) than in the OECD (12%) and the rest of the world (15%). More than two-thirds (69%) of electricity is produced from renewables, mostly hydropower (78%).
- GHGs are often released from the same sources as air pollutants such as fine particulate matter ($PM_{2.5}$) that includes black carbon and affects human health. Mean population exposure to $PM_{2.5}$ has been slowly decreasing since 1990 across the LAC region. However, annual exposure levels (18 μg/m^3 in 2019) remain significantly above the WHO guideline (5 μg/m^3). Exposure is particularly high in large urban areas where economic activity is concentrated and demand for mobility highest.
- In 2019, an average of 260 premature deaths per million inhabitants was attributed to exposure to $PM_{2.5}$. The associated welfare costs were estimated at 2.8% of LAC GDP. The Caribbean is the most affected due to high exposure to the pollutant, fragile healthcare systems and a high marginal cost of enhancing safety.

Context

Greenhouse gas (GHG) emissions from human activities disturb the radiative energy balance of the earth-atmosphere system. They exacerbate the natural greenhouse effect, leading to temperature changes and other disruptions of the earth's climate. Carbon dioxide (CO_2) from the combustion of fossil fuels is the main contributor to greenhouse gases and a key factor in countries' ability to mitigate climate change. Short-lived climate forcers (SLCFs), such as methane, ozone and black carbon, have shorter atmospheric residence times, but a stronger warming impact in the short run. Reducing their emissions can have immediate effects on atmospheric warming. Changes in land use and land cover also play a role by altering the GHGs captured or released by carbon sinks.

GHGs are often released from the same sources as air pollutants such as fine particulate matter ($PM_{2.5}$), which includes black carbon, a SLCF that results from the incomplete combustion of fuels and biomass, including through forest fires and agricultural burning. These pollutants have severe public health impacts Hence, reducing their emissions helps mitigate GHG emissions, while at the same time improving air quality with benefits for human health, agricultural production and ecosystems. (Sun et al., 2022[17]) (IPCC, 2023[18]).

Policy challenges

The main challenge is to reduce GHG emissions to both mitigate climate change and reduce local air pollution in an economically efficient and socially acceptable manner. This implies a range of low-carbon strategies to decouple GHG emissions from economic growth and which may involve different specific policies depending on local conditions. Relevant policies include increasing the share of renewable energy sources in the supply mix, reducing energy intensity by adopting energy-efficient production processes, increasing the energy efficiency of consumer goods and services, particularly in the transport sector, and protecting and expanding carbon sinks such as forest areas and wetlands.

Domestic mitigation efforts must be streamlined across other policy areas. Given the connection between GHG emissions and local air pollution, implementing measures that reduce emissions of GHG and air pollutants together at minimum cost represents “win-win” solutions for both climate and health policy objectives. Effective pollution prevention and control measures are especially important, these need to be tailored to local circumstances as both the sources of air pollution and severity of exposure vary across and within countries.

Measures should be prioritised in terms of their health benefit, for example more stringent measures are required in densely populated areas or for emission sources located upwind from urban areas. Other relevant policies include mainstreaming sustainable construction and transport in urban and rural planning and moving from linear to circular economy business models. Finally, behavioural and lifestyle changes may ultimately be the key for long-term mitigation objectives, particularly with respect to urban mobility.

Ensuring a proper mix of policy instruments - such as carbon pricing, investing in new technologies and removing government subsidies and other support for fossil fuels - plays an important role in mitigation efforts. It also implies considering agriculture and land-use in national mitigation policies and strengthening the capacity of the environment to store carbon by protecting ecosystems, an especially important challenge in the LAC region. Moreover, given that climate change is a global phenomenon, mitigation efforts must be placed in the context of carbon emissions associated with international trade.

Measuring progress and performance

Progress and performance can be assessed against domestic objectives and international goals and commitments to reduce GHG and the associated air pollutant emissions.

The main international agreement is the United Nations Framework Convention on Climate Change (Box 2). LAC countries have established their climate mitigation objectives to 2030 and 2050 through their Nationally Determined Contributions (NDCs) and Long-Term Strategies (LTS) (Table 1). Several countries have gone further, committing to carbon neutrality. Climate change mitigation is also part of the 2030 Agenda for Sustainable Development under Goal 13 "*Take urgent action to combat climate change and its impacts"* with targets related to the integration of climate change measures into national policies, strategies and planning, and to education, awareness-raising and human and institutional capacity on climate change mitigation.

Reducing negative impacts from air pollution is part of the 2030 Agenda under Goal 3 *"Ensure healthy lives and promote well-being for all at all ages"* and under Goal 11 *"Make cities and human settlements inclusive, safe, resilient and sustainable"*.

Box 2. The UNFCCC and the Paris Agreement

The centrepiece of international climate governance is the United Nations Framework Convention on Climate Change (UNFCCC) opened for signature at the United Nations Conference on Environment and Development (UNCED) in Rio de Janeiro in 1992 and in force since 21 March 1994. The objective of the Convention is to stabilise GHG concentrations "at a level that would prevent dangerous anthropogenic (human induced) interference with the climate system." The Convention established a broad set of principles, including the "common but differentiated responsibilities and respective capabilities". The Convention was first operationalised through the Kyoto Protocol that set binding emission reduction targets for industrialized countries and economies in transition compared to 1990 levels over the five-year period 2008–2012 (the first commitment period). A second commitment period, started in 2013 and lasted until 2020.

At the 21st session of the Conference of Parties (COP21) in Paris, on 12 December 2015, Parties to the UNFCCC reached a landmark agreement to combat climate change and to accelerate and intensify the actions and investments needed for a sustainable low-carbon future. The Paris Agreement (PA) sets out the goal of limiting average global warming to 2ºC above pre-industrial levels and identifies a need for further efforts to confine the increase to 1.5ºC.

The basis of the PA is a voluntary, "bottom-up" approach. Countries submit their post-2020 climate actions reflecting their highest possible ambition through successive Nationally Determined Contributions that they intend to achieve. NDCs embody targets and efforts by each country to reduce national emissions and adapt to the impacts of climate change, together with information necessary for clarity, transparency and understanding.

The PA is instrumental in increasing climate mitigation ambitions. Its implementation would lead to considerably lower global GHG emissions than previously projected. New estimates considering current PA commitments suggest that global GHG emissions will peak before 2030 (UNFCCC, 2022). The Glasgow Climate Pact and the Sharm El-Sheik Implementation Plan adopted at COP26 and COP27 respectively, made a further contribution to strengthening countries' implementation capacity by completing the Paris Agreement's rulebook and increasing the financial commitments to address more ambitious and complex targets.

However, the pace of emission reductions is too slow. Estimates suggest that current commitments and targets will not suffice to achieve the goals set out by the PA (UNFCCC, 2022). To address the climate emergency, countries must both significantly raise their level of ambition and ensure that their targets are met through effective climate action.

Indicators

The indicators presented in this section describe:

- GHG emission trends;
- Share of GHG emissions in LAC by sub-region;
- GHG emissions by sector;
- CO_2 productivity and intensity;
- Energy supply mix and share of renewables in electricity generation;
- Mean population exposure to $PM_{2.5}$ concentrations;
- Premature mortality attributed to exposure to $PM_{2.5}$ and associated welfare costs.

Climate objectives in the LAC region

Under the Paris Agreement, all 33 LAC countries have submitted GHG emission reduction commitments to the UNFCCC through their NDCs, to be achieved by 2030. However, the commitments vary across countries in terms of clarity and information details, sectors and gases covered, baseline scenarios and reference years (Table 1). Measuring progress is hampered by the lack of official GHG emission data for the LAC region. Most LAC countries do not produce regular, up-to-date and comprehensive GHG emission inventories. Therefore, research estimates and data on energy-related CO_2 emissions are used here as proxies.

By 2022, 29 LAC countries had updated their NDCs, since their first submission,[5] many of which presented an increase in ambition. Sixteen countries have committed to net zero targets by 2050 or earlier (Table 1).[6] The legal status of the commitments varies. Only Chile and Colombia have their targets enshrined in a climate law, while Jamaica and Paraguay have declared a net zero pledge. Twelve countries (Antigua and Barbuda, Argentina, Barbados, Brazil, Costa Rica, Dominican Republic, Grenada, Guyana, Panama, Peru, Suriname, and Uruguay) have included their objectives in a policy or planning document.

The scope of gases covered in national targets varies across countries. Chile, Colombia and Costa Rica provide detailed and separate emission reduction and removal targets by sector, with transparent pathways for the land use, land use change and forestry (LULUCF) sector. This is not the case for other LAC countries, most of which do not specify the target's emission coverage or sectoral breakdown, do not have separate reduction and removal targets, transparent assumptions on removals, or information on the anticipated pathway towards net zero. Only seven countries cover all GHGs in their pledges (Argentina, Brazil, Chile, Colombia, Costa Rica, Panama and Peru), leaving a majority of countries with either unspecified pledges or, in the case of countries such as Uruguay, pledges limited to CO_2. A focus solely on CO_2 is of concern in a region where emissions from methane-intensive sectors such as agriculture contribute to over a quarter of total emissions and represents a missed opportunity to achieve net zero. Eight countries, namely Bolivia, Chile, Costa Rica, Colombia, Dominican Republic, Ecuador, Mexico, and Paraguay, include black carbon in their NDCs.

Table 1 shows the targets and commitments presented by LAC countries. Some countries have targets that allow an increase in GHG emissions (e.g. the Bahamas, the Dominican Republic, Honduras, Haiti, Saint Lucia, Mexico, and Peru). Thirteen LAC countries do not have a clear target covering all sectors and all gases. Therefore, GHG emissions in the region are expected to increase further.

Countries have set out a range of policy approaches to comply with their commitments. These vary from direct regulations, carbon pricing, measures to reduce deforestation, among other approaches and efforts (see Climate actions and policies).

Table 1. Nationally Determined Contributions in LAC countries

Country	NDC update (yes/no), Year of publication	GHG emission reduction target as stated	Net zero target
Antigua and Barbuda	Yes, 2021	Sector specific targets for electricity generation and transport	2040
Argentina	Yes, 2021	Not exceeding 349 MtCO2e of net emission by 2030.	2050
Bahamas (the)	Yes, 2022	30% GHG emissions reduction relative to BAU scenario by 2030.	N/A
Barbados	Yes, 2021	35% GHG emissions reduction relative to BAU scenario by 2030.	2030
Belize	Yes, 2021	Reduction of 1.0 MtCO2e in annual emissions by 2030.	N/A
Bolivia (Plurinational State of)	Yes, 2022	Targets for specific sectors and gases. The overall goal will be calculated when preparing the First Biennial Transparency Report.	N/A
Brazil	Yes, 2022	Reduction of emissions by 50%, in 2030 compared to 2005.	2050
Chile	Yes, 2020	A GHG emissions budget of no more than 1 100 MtCO2e in the period 2020-2030.	2050
Colombia	Yes, 2020	Limit GHG emissions to a maximum of 169.44 MtCO2e in 2030.	2050
Costa Rica	Yes, 2020	Limit net GHG emissions to an absolute maximum of 9.11 MtCO2e by 2030.	2050
Cuba	Yes, 2020	No clear overall target.	N/A
Dominica	Yes, 2022	Overall emissions reduction targets of 39% by 2025 and 45% by 2030.	N/A
Dominican Republic (the)	Yes, 2020	27% GHG emissions reduction relative to BAU scenario by 2030.	2050
Ecuador	No, 2019	No clear target.	N/A
El Salvador	Yes, 2022	No clear target.	N/A
Grenada	Yes, 2020	40% GHG emissions reduction relative to 2010 levels by 2030.	2050
Guatemala	Yes, 2022	No clear target.	N/A
Guyana	No, 2016	No clear overall target.	Achieved
Honduras	Yes, 2021	Sector specific target for 2030.	N/A
Haiti	Yes, 2022	Reduction of emissions from 18.970 MtCO2e in the reference scenario to 17.774 MtCO2e in the unconditional scenario.	N/A
Jamaica	Yes, 2021	25.4% reduction relative to BAU scenario by 2030.	2050
Mexico	Yes, 2022	22% GHG emissions reduction relative to BAU scenario by 2030.	N/A
Nicaragua	Yes, 2020	No clear target.	N/A
Panama	Yes, 2020	No clear target.	Achieved
Peru	Yes, 2020	Limit GHG emissions to a maximum of 208.8 MtCO2e by 2030.	2050
Paraguay	Yes, 2021	Conditional 20% reduction from 2030 BAU emission level.	2050
Saint Kitts and Nevis	Yes, 2021	Conditional on international support, reduction of CO2 emissions by 61% by 2030 relative to 2010.	N/A
Saint Lucia	Yes, 2021	7% GHG emissions reduction in the energy sector relative to 2010 by 2030.	N/A
Saint Vincent and the Grenadines	No, 2016	22% GHG emissions reduction relative to BAU scenario by 2025.	N/A
Suriname	Yes, 2019	No clear target.	Achieved
Trinidad and Tobago	No, 2018	Sector specific targets for 2030.	N/A
Uruguay	Yes, 2022	Gas specific targets for 2030.	2050
Venezuela (Bolivarian Republic of)	Yes, 2021	20% GHG emissions reduction relative to BAU scenario by 2030.	N/A

Note: BAU refers to “Business as usual” GHG emission projections. Countries report targets that are unconditional and conditional on international support. In this table, unless specified, only unconditional targets are presented. In addition, countries report overall targets and sector specific targets. When overall target is available, only the overall target is presented. When an overall target is not available, sector specific targets are presented.
Source: OECD Secretariat compilation from NDC and LTS.

Table 2. Estimated GHG emissions and targets

Selected Latin American countries

Country	National GHG emissions, latest available year				Estimated distance to NDC 2030 target (latest available year – 2030) in % (d)
	Year (a)	Total emissions excl. LULUCF in $MTCO_2e$	Stated and estimated NDC 2030 target in $MTCO_2e$ (b)	Estimated emissions in line with the scope of the NDC 2030 target in $MTCO_2e$ (c)	
Argentina	2014	322.6	349.0	368.3	-5.2%
Brazil	2016	1014.7	1176.3	1305.6	-9.9%
Chile	2018	112.3	95.0	112.3	-15.4%
Colombia	2018	180.7	169.4	279.2	-39.3%
Costa Rica	2017	14.5	9.1	11.5	-20.8%
Mexico	2019	736.6	644.2	534.7	12.5%
Peru	2016	96.3	208.8	205.3	1.7%

Notes: This table builds on both national data from official documents and provisional estimates by the IPAC Secretariat. It provides rough indications on progress made and to be made, but can in no way be taken to reflect the official position of countries covered in the table.
(a) Latest year for which national GHG emissions data are available, considering data officially submitted to UNFCCC, national emission inventories and data available in other official documents such as NDCs and National Communications to the UNFCCC.
(b) Countries' targets estimated by the OECD using information provided in NDCs. For further information on the methodology used, see (OECD, forthcoming[19]).
(c) Total emissions for the latest year available covering sectors and gases that are specified in the NDC 2030 target. When detailed sector and gas level data are not available, the closest disaggregated official data available have been used (i.e. for Chile, Colombia and Costa Rica). For further information on the methodology used, see (OECD, forthcoming[19]).
(d) A negative distance to target shows the percentage of emissions a country needs to reduce to reach the target. A positive distance to target shows that a country's target allows an increase of emissions.
Source: OECD (2023), "Air and climate: Greenhouse gas emissions by source", OECD Environment Statistics (database), https://doi.org/10.1787/data-00594-en; UNFCCC (2022) "Greenhouse Gas Inventory Data", http://di.unfccc.int/; UNFCCC (2022), "NDC Registry", http://www4.unfccc.int/ndcregistry/Pages/All.aspx; IPAC Secretariat calculations.

Greenhouse gas emissions

Recent trends and developments

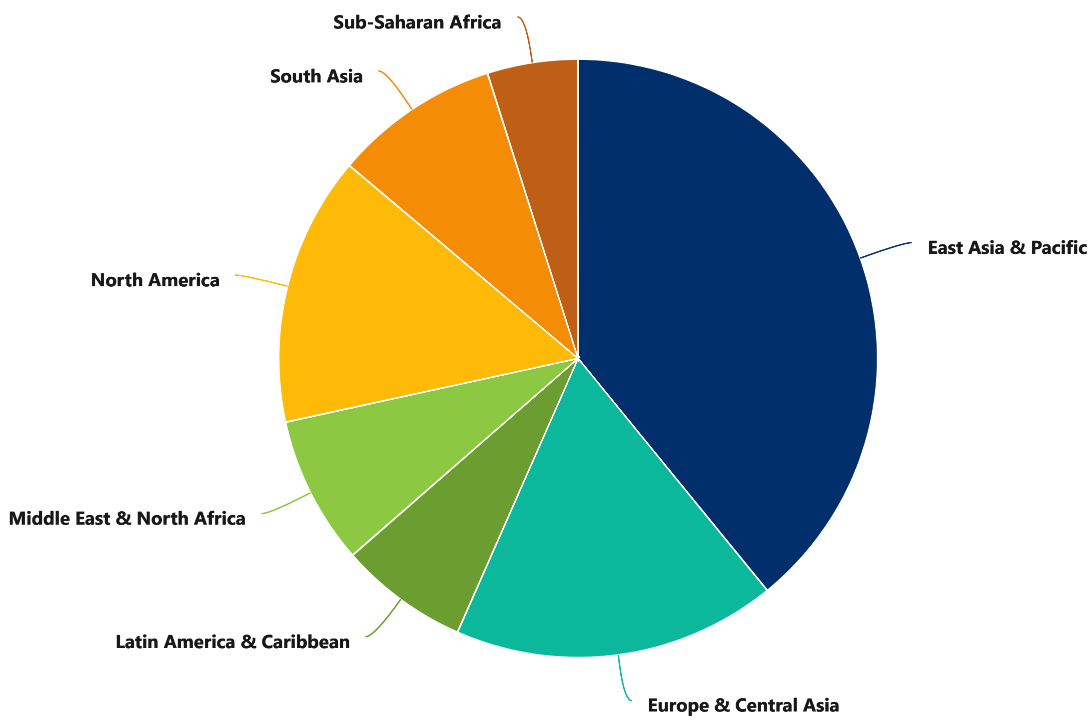
Total greenhouse gas emissions

Available estimates suggest that gross emissions (i.e. excluding LULUCF) in the region have grown by 61% since 1990, reaching about 3.2 Gt of CO_2e in 2019 (Climate Watch, 2022[20]). This represented approximately 6.7% of global GHG emissions, about the same share as in 1990. This is proportional to the region's share in global GDP (7.1%) and slightly lower than its share in global population (8.4%). Nevertheless, despite being a relatively small contributor to climate change, LAC countries have a significant role to play in global mitigation efforts due to their potential for natural carbon capture, particularly around the Amazon River basin.

Emissions grew in line with GDP until 2014, then stabilised and even decreased, suggesting a relative decoupling enhanced by the effects of the COVID-19 pandemic. There are, however, significant differences between sub-regions, reflecting their size and level of economic activity. South America generates most of LAC GHG emissions (71%), followed by Central America (24%) and the Caribbean (4%) (Figure 4). Brazil contributed almost a third (32%) of LAC's total gross GHG emissions in 2019, the top five emitters (Brazil, Mexico, Argentina, Venezuela, and Colombia) contributed about 78% and the top ten emitters, 90%.[7] The overall trend is driven by South America, where emissions increased by 61% between 1990 and 2019, followed by Central America (+68%) and the Caribbean (+26%) (Figure 5).[8]

Figure 4. Regional GHG emissions

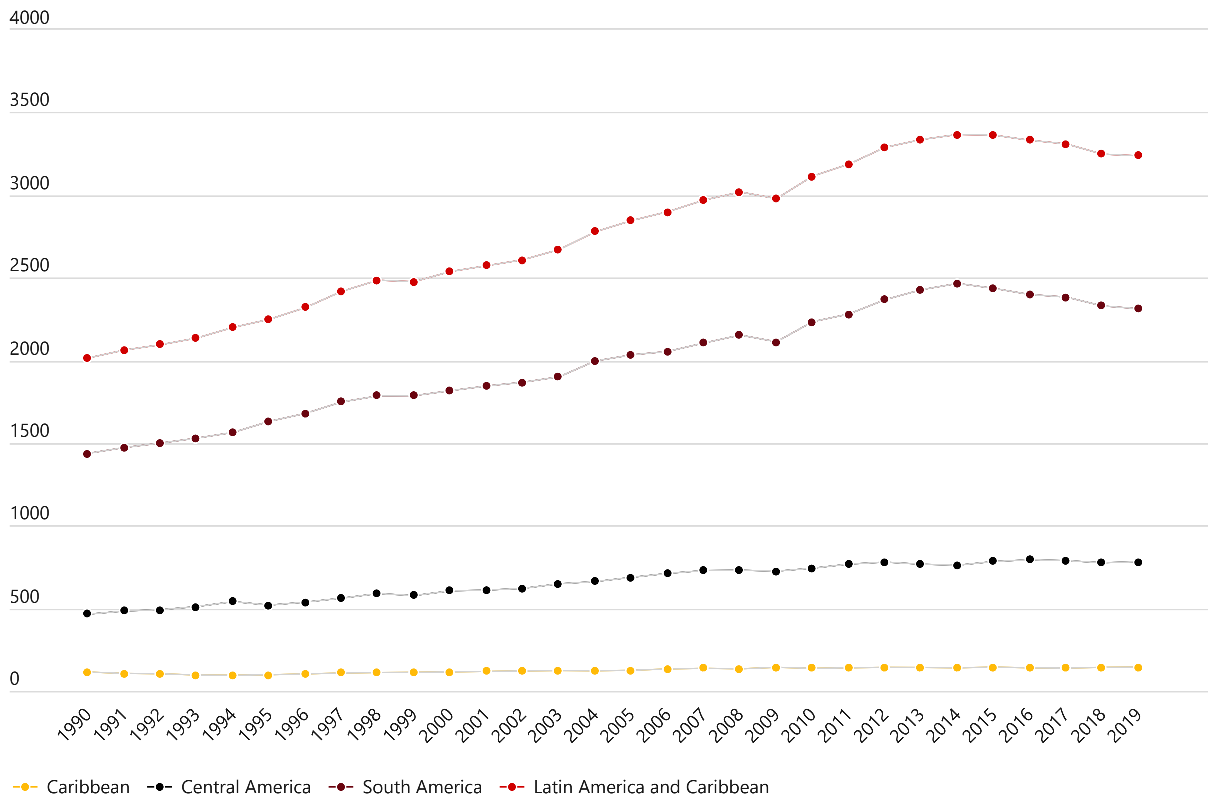
Percentage of total emissions, 2019



Compare: Link to the dashboard.
Note: Total emissions exclude land use change and forestry (LUCF).
Source: OECD et al. (2022), Latin American Economic Outlook 2022: Towards a Green and Just Transition, OECD Publishing, Paris, https://doi.org/10.1787/3d5554fc-en.

Figure 5. Evolution of GHG emissions, by sub-region

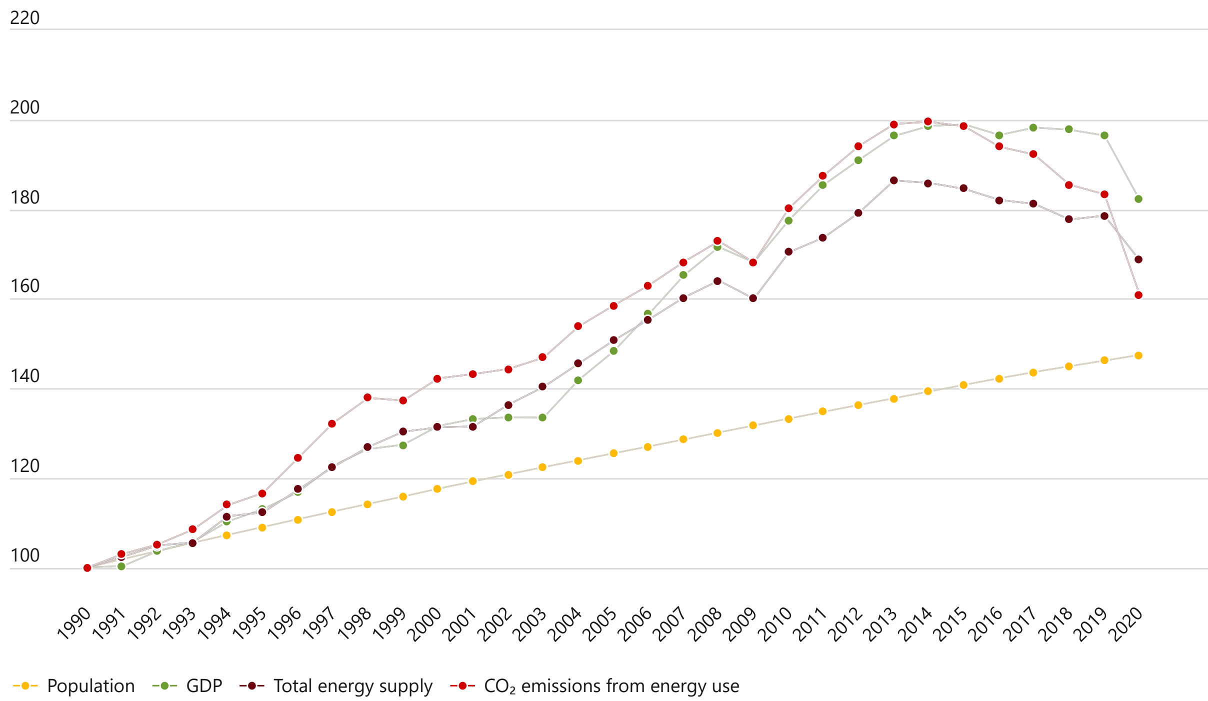
Total, excluding LUCF



Compare: Link to the dashboard.
Source: (Climate Watch, 2022[20]).

Figure 6. Decoupling trends in LAC

1990-2020



Compare: Link to the dashboard.

Note: Population, GDP and Total Energy Supply include all 47 LAC countries. CO_2 emissions from energy use include the following 23 countries: Argentina, Brazil, Chile, Colombia, Costa Rica, Cuba, Curacao, Dominican Republic, Ecuador, El Salvador, Guatemala, Haiti, Honduras, Jamaica, Mexico, Nicaragua, Panama, Paraguay, Peru, Bolivia, Trinidad and Tobago, Uruguay, Venezuela.

Source: OECD (2023), "Air and climate: Greenhouse gas emissions by source", OECD Environment Statistics (database), https://doi.org/10.1787/data-00594-en; (Climate Watch, 2022[20]).

The profile of emissions in LAC differs from that of OECD and EU countries. In LAC, fuel combustion (including for electricity and heat generation, transportation and manufacturing) generates most (43.4%) of the region's net emissions. This share is much lower than in the OECD area (83.6%) and partly reflects a cleaner energy mix (i.e. a higher share of renewables in electricity generation) (see Energy mix). LAC also stands out for its large share of emissions from agriculture that amounts to 25.3% of net emissions (compared to 8.5% in the OECD area). The LULUCF sector acts as a net sink in the OECD, whereas it generates about 20% of net emissions in LAC (Climate Watch, 2022[20]) (Figure 7).

These patterns are heavily influenced by the emission profile of South America where agriculture and LULUCF account for almost a third and a fourth of the sub-region's net emissions, respectively. This reflects the importance of agriculture in the economy as well as the massive deforestation occurring in the region. Forest loss is a major concern, mainly caused by the conversion of land for agriculture, timber production and, to a lesser extent, the expansion of urban areas. Deforestation in Brazil has accelerated in the past ten years. Nicaragua and Paraguay experienced high loss rates in the last 20 years, although the areas lost are smaller. On the other hand, Costa Rica and Chile managed to increase their forest cover thanks to national afforestation policies (OECD et al., 2022[5]).

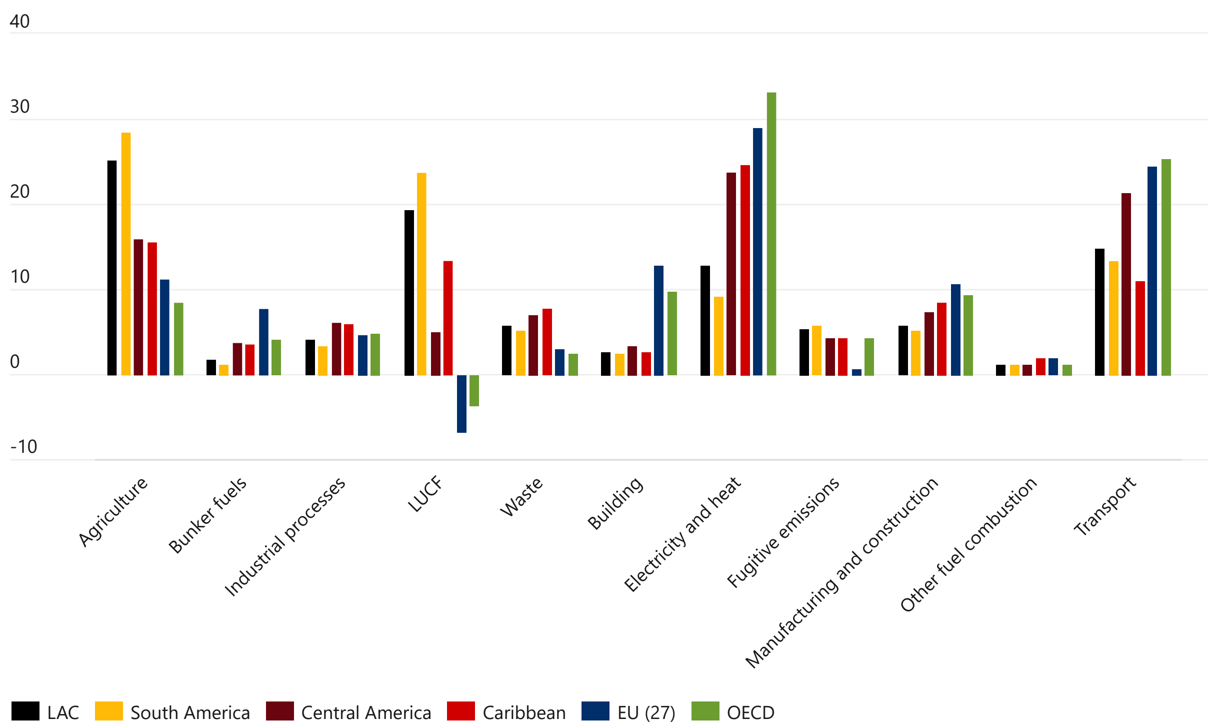
Central America has an emission profile closer to OECD countries, with energy generation being the main source, followed by transport. In the Caribbean, energy generation is also the main source of GHGs, but because of the relatively small size of Caribbean islands, transport comes only fourth after agriculture and LULUCF (Figure 7).

Since 1990, emissions from almost all sources have grown continuously, particularly emissions from fuel combustion. This was due to increased emissions from transport, and from electricity and heat production. Agricultural emissions increased by about 32% due to the rise in livestock breeding in South and Central America between 1990 and 2010. Emissions from industrial processes and waste management are lower, but have significantly increased since 1990. They tripled and doubled respectively (OECD et al., 2022[5]).

Transport is a major source of GHG emissions, mainly due to the large size of many LAC countries and the reliance on internal combustion engine vehicles. In LAC countries, the urban layout and the poor quality and availability of public transport further favour the use of private vehicles. In 2020, the motorisation rate reached 311 vehicles (passenger cars and commercial vehicles) per inhabitant in Argentina, 246 and 214 in Chile and Brazil, respectively (OICA, 2023[21]).

Figure 7. Emissions by sector across LAC sub-regions, compared to the EU and the OECD

Percentage of total emissions, 2019



Compare: Link to the dashboard.
Note: The LAC average includes data available for 33 countries. The energy sector includes building, electricity and heat, fugitive emissions, manufacturing and construction, other fuel combustion and transport.
Source: OECD et al. (2022), Latin American Economic Outlook 2022: Towards a Green and Just Transition, OECD Publishing, Paris, https://doi.org/10.1787/3d5554fc-en.

CO_2 emission intensity

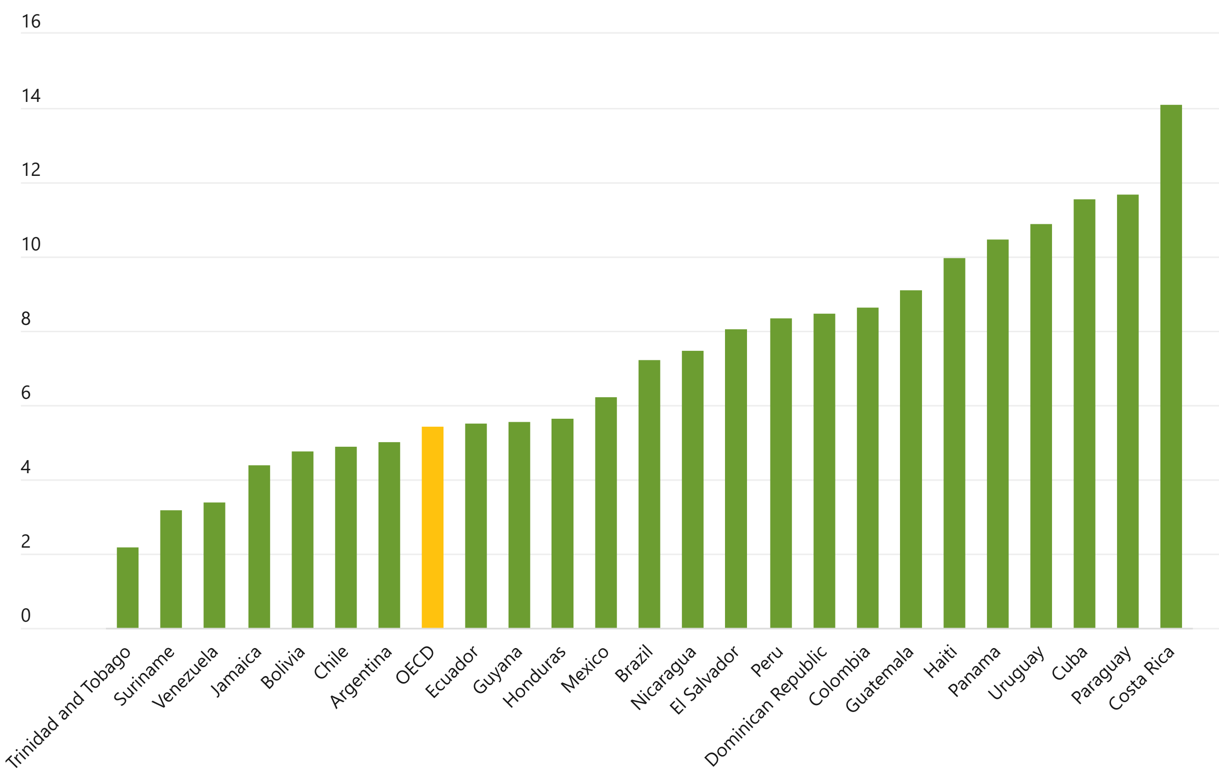
CO_2 emissions from energy use increased by 84% between 1990 and 2019 in the region, with some countries increasing their emissions by 219% (Dominican Republic) and others reducing them by 30% (Cuba) (IEA, 2022[22]). In 2020 emissions dropped by 12% from the previous year due to the COVID-19 pandemic and associated restrictions in activities and mobilities.

In 2020, the per capita level of energy-related CO_2 emissions was significantly lower in LAC countries (2 tonnes per capita) than the OECD average (7.5 tonnes per capita). This reflects lower income and consumption levels and a less carbon intensive energy mix (Figure 8). A more nuanced picture emerges when accounting for emissions from agriculture, forestry and land use change. Net GHG emission intensities are estimated to be higher (6.4 tonnes of CO_2e per capita in 2019), but still below the OECD average (10.3 tonnes of CO_2e per capita) (Cárdenas and Orozco, 2022[23]).

LAC countries also have higher levels of CO_2 productivity than OECD countries. LAC countries generated on average 6.6 USD of GDP per kg of CO_2 emitted in 2020 (an increase compared to 5.8 UDS/kg in 1990), and above the OECD average of 5.5 USD/kg (Figure 9). While CO_2 productivity in Central America has consistently remained under the LAC average since 1990, and South America above average, the Caribbean has experienced the greatest shift over the past three decades, increasing from 4.3 USD/kg of CO_2 emissions in 1990 to 7.8 USD/kg in 2020.

Figure 8. Production-based CO_2 productivity

GDP per unit of energy-related CO_2 emissions (USD/kg), 2020

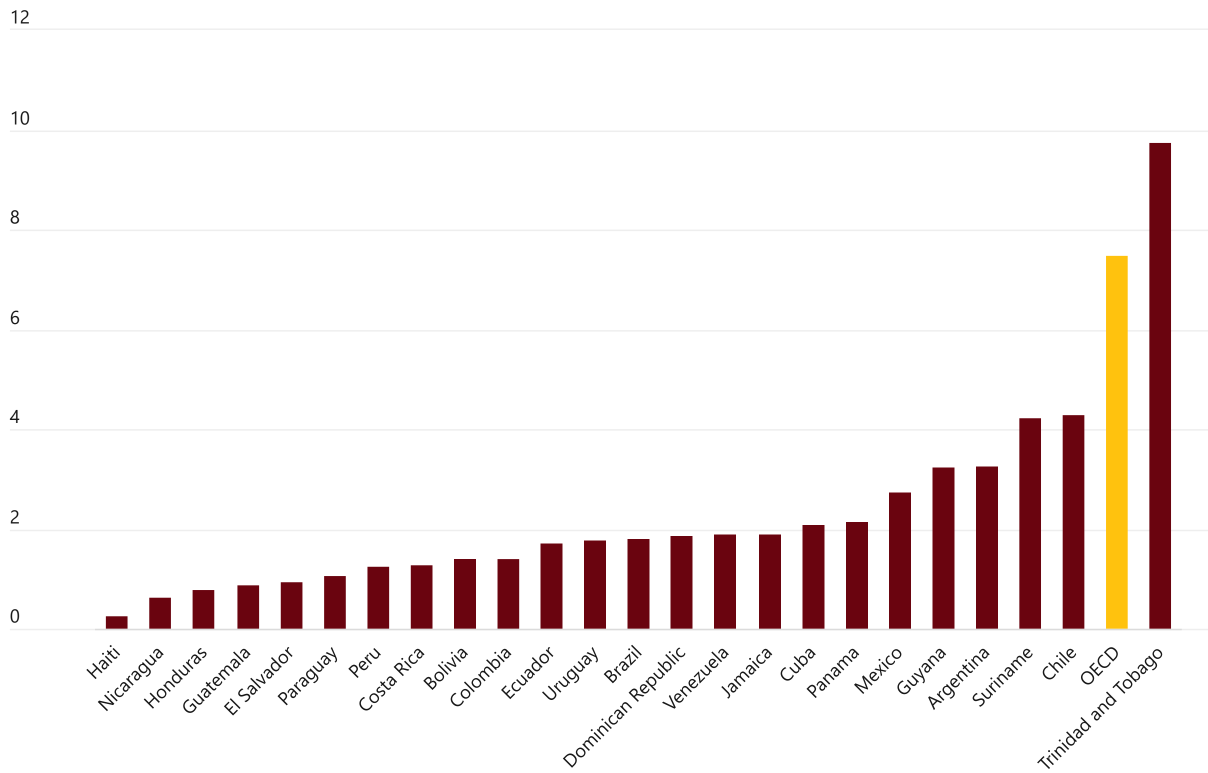


Compare: [Link to the dashboard.]

Source: OECD, "Green growth indicators", OECD Environment Statistics (database), https://doi.org/10.1787/data-00665-en, based on OECD and IEA data.

Figure 9. Production-based CO_2 intensity per capita

Tonnes of energy-related CO_2 per capita, 2020



Compare: Link to the dashboard.
Source: OECD, "Green growth indicators", OECD Environment Statistics (database), https://doi.org/10.1787/data-00665-en, based on OECD and IEA data.

Comparability, interpretation and data availability

GHG emissions

Official GHG emission (inventory) data are not regularly compiled and updated in LAC countries. Data and times series available through the UNFCCC and OECD show many gaps, including for large emitters. Only eight countries regularly publish and update time series back to 1990. This is a major impediment to assess trends and progress in mitigation efforts.

In this report, data from the World Resource Institute (WRI) have been used to derive aggregated (global and regional) trends and to provide rough estimates of emissions from key sectors and sources. However, for individual countries, only emission data available from official sources (UNFCCC, NDCs) and the OECD and IEA databases have been used.

The Climate Watch[9] data, compiled by WRI,[10] use a combination of official sources and research estimates. The data cover all parties to the UNFCCC, all gases and the main Intergovernmental Panel on Climate Change (IPCC) sectors. The methodology used follows IPCC's guidelines to compile sectoral emissions drawing on sources that have been widely adopted including in the IEA's GHG Emissions from Fossil Fuel Combustion, the FAO's agriculture and land use emission data, US Environmental Protection Agency's non-CO_2 gases emission data, and fossil related CO_2 emissions from the Global Carbon Project.

Differences with existing official data are not explicitly provided in the documentation and are difficult to explain (Climate Watch, 2022[20]).

CO_2 emissions from energy use

The CO_2 emission estimates are affected by the quality of the underlying energy data, but in general the comparability across countries is quite good. Carbon productivity is defined as the economic value, in terms of GDP, generated per unit of CO_2 emitted in production. It provides information on the level of decoupling between economic activity and carbon emissions and insights into the environmental and economic efficiency with which production processes use energy resources and ecosystem services. Its interpretation should take into account the structure of countries' energy supply, trade patterns and climate factors. Reductions in national emissions can also be achieved by offshoring domestic production and, thus, the related domestic emissions. Evidence of decoupling and productivity growth based on domestic emissions, therefore, may reveal only part of the story.

GHG mitigation and air pollution

Climate mitigation and local air pollution policies have multiple co-benefits and synergies. They are especially important in LAC where air pollution is the leading environmental health risk, particularly for vulnerable groups such as the very young and the very old, and a major cause of environmental degradation (PAHO, 2023[24]).

Exposure to fine particulate matter ($PM_{2.5}$) is a good indicator of local air pollution and the associated human health effects. $PM_{2.5}$ is predominantly emitted by motor vehicles, the use of wood as fuel and wildfires. Chronic exposure, even to moderate levels, substantially increases the risk of heart disease and stroke and is an important cause of premature death in LAC countries (Institute for Health Metrics and Evaluation, 2019[25]). It also increases the risk of respiratory diseases, including lung cancer, chronic obstructive pulmonary disease, and respiratory infections.

Fine particulates also embody black carbon, a short-lived climate forcer that results from the incomplete combustion of fuels and biomass, including through forest fires and agricultural burning. Black carbon accelerates the melting of snow and ice increasing climate change by reducing the albedo effect and affecting agricultural yields and food security (OECD, 2021[26]). Earlier research drawing on earth observation data showed that air pollution and smoke generated during the biomass burning season affect precipitation patterns in the Amazon basin that may enhance climate-related hazards (Koren et al., 2004[27]). They have also been associated with the melting of Andean glaciers (Rabatel et al., 2013[28]). Such effects in turn impact the livelihoods of Andean inhabitants who depend on the glaciers for drinking water, farming and the generation of hydropower, an important energy source in the region providing 8% of total energy supply, and 54% of electricity production in 2020 (IEA, 2023[29]) (IEA, 2022[10]).

Urban planning and policies that incentivise public transportation can significantly reduce air pollution levels and contribute to curbing GHG emissions. Understanding the relationship between pollution levels and the urban environment is particularly useful for policymakers when air quality data are limited. Policy-amenable features of cities with a proven association with pollution levels can be targeted to protect population health and the environment. These characteristics include city density, fragmentation, congestion, quality of public transport and number of green spaces (Gouveia et al., 2021[30]). Relevant policies include spatial planning and street redesign, the development of sustainable transport networks, carbon pricing and incentives for vehicle electrification, all of which are central to climate strategies. Associated with high effectiveness and increasing public acceptability, these policies can bring the transformational change needed to meet net-zero goals, while improving people's lives (OECD, 2021[31]).

Recent trends and developments

In Central and South America accelerated urban development and industrialisation, and increased energy production and consumption, are the main contributors to air pollution. In the Caribbean, population exposure to $PM_{2.5}$ reflects a high population density combined with a dense road network. Socio-economic inequality also plays a role, with disadvantaged sociodemographic groups exposed to higher levels of air pollution (Libertun de Duren et al., 2022[32]).

Exposure to air pollution is particularly high in big urban areas where economic activity is concentrated and where demand for mobility is highest. Cities most affected by air pollution include Monterrey, Guadalajara, Mexico City, Cochabamba, Santiago, Lima, Bogotá, Medellín, Montevideo and San Salvador, where concentration levels exceed the values recommended by the World Health Organisation (WHO) (WHO, 2022[33]). Furthermore, there are large differences between income groups. The highest exposure to outdoor air pollution affects households living near roads and industrial sites. In some cases, differences in exposure are linked to inequalities in the development, implementation of and compliance with environmental law, policy and regulation (PAHO, 2023[24]).

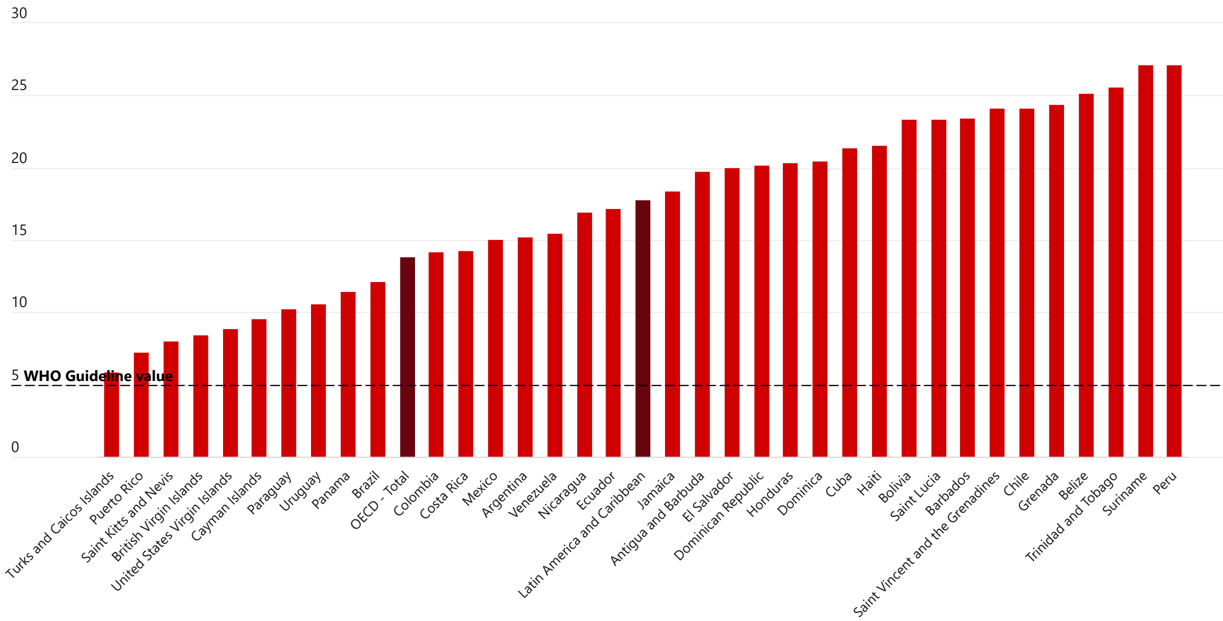
Although air quality standards have been established in some LAC countries, these are frequently exceeded or not consistently enforced. Many countries and cities in the region do not have standards for fuel efficiency, vehicle exhaust emissions, or fuel quality, which are generally considered to be the basic standards for a cleaner transport. With growing vehicle stocks and road traffic, this entails increased risks of air pollution and health issues (Maxwell, 2019[34]).

Mean population exposure to $PM_{2.5}$

The average level of pollution from fine particulate matter to which a LAC inhabitant is exposed, has slowly decreased from an average of 23 micrograms of $PM_{2.5}$ per cubic metre (µg/m^3) in 1990 to 18 µg/m^3 in 2019. However, this level remains above the OECD average of 14 µg/m^3 and the WHO guideline of not exceeding an annual mean $PM_{2.5}$ concentration of 5 µg/m^3, which is the lowest range over which adverse health effects can be observed. About 92.5% of the LAC population is exposed to $PM_{2.5}$ concentrations above 10 µg/m^3, significantly more than the OECD average of 61.7%. The countries most affected are Peru, Suriname, Trinidad and Tobago, Belize, Grenada and Chile (Figure 10).

Figure 10. Mean population exposure to $PM_{2.5}$ concentrations

Micrograms per cubic metre, 2020



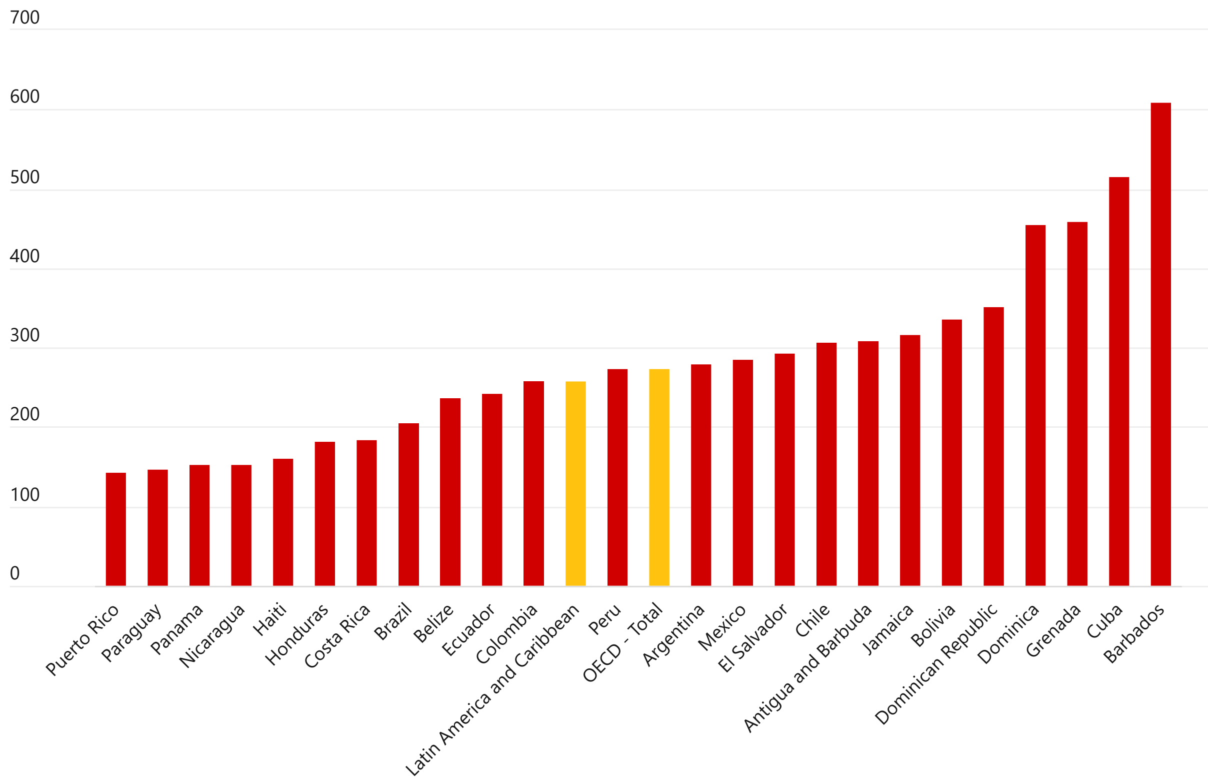
Compare: Link to the dashboard.
Source: OECD, "Air quality and health: Exposure to PM2.5 fine particles – countries and regions", OECD Environment Statistics (database), https://doi.org/10.1787/96171c76-en.

Mortality attributed to exposure to $PM_{2.5}$

Local air pollution is a major health risk in the region. In 2019, chronic respiratory diseases caused over 180 000 deaths in the LAC region, most of which were due to chronic obstructive pulmonary disease. Brazil represented 43% of chronic respiratory diseases, followed by Mexico, Colombia, Venezuela, Peru, Cuba, Ecuador and Bolivia. In 2019, an average of 260 premature deaths per million inhabitants can be attributed to $PM_{2.5}$ across the region (Figure 11), an increase from 231 deaths in 1990.

Figure 11. Mortality attributed to exposure to $PM_{2.5}$

Premature deaths, per million inhabitants, 2019



Compare: Link to the dashboard.
Source: OECD (2023), "Air quality and health: Mortality and welfare cost from exposure to air pollution", OECD Environment Statistics (database), https://doi.org/10.1787/c14fb169-en.

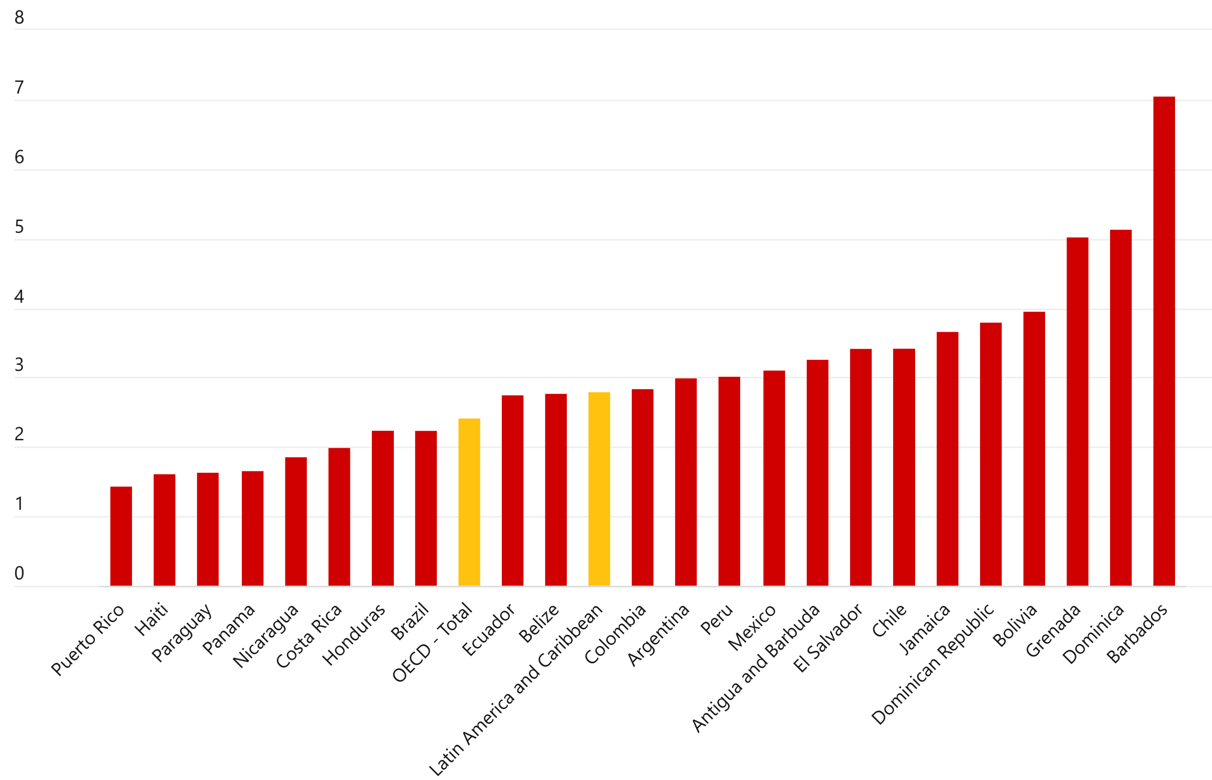
Welfare cost of mortality from exposure to $PM_{2.5}$

Mortality and morbidity from exposure to air pollution generate considerable economic costs. In 2019, the welfare cost associated with premature mortality alone accounted for 2.8% of GDP in LAC (Figure 12), compared to an OECD average of 2.4%. Accounting for the cost of morbidity for example from losses in labour productivity and in agricultural productivity, or medical treatment would further increase these costs.

Losses are particularly high in the Caribbean. Barbados experienced the highest welfare losses, about 7% of GDP in 2019. Dominica, Grenada, Dominican Republic, Jamaica, and Antigua and Barbuda had costs above 3% of GDP. This is due to the compounding effects of high exposure to the pollutant, fragile healthcare systems with a high proportion of premature deaths, and high marginal costs of enhancing health safety. The high marginal cost of enhancing safety could be due to the health financing systems, the cost of healthcare and the cost of sick leave, all influencing the willingness to pay for reducing the risks posed by air pollution. In South America, the countries most impacted are Bolivia, with an estimated welfare cost from mortality of 4% of GDP in 2019, as well as Chile, Peru, Argentina, and Colombia, all of which have cost above the LAC average.

Figure 12. Welfare cost of mortality from exposure to $PM_{2.5}$

Percentage of GDP equivalent, 2019



Compare: Link to the dashboard.
Source: OECD (2023), "Air quality and health: Mortality and welfare cost from exposure to air pollution", OECD Environment Statistics (database), https://doi.org/10.1787/c14fb169-en.

Comparability, interpretation and data availability

International data on emissions of $PM_{2.5}$ are available for many but not all LAC countries. For example, data on mortality attributed to air pollution exposure and the associated welfare cost are not available for 25 LAC territories, including many Caribbean islands, as well as Uruguay, Venezuela, Suriname and Guatemala. The estimation methods for emissions, the scope of sources and particles included in estimations differ between countries. $PM_{2.5}$ is the pollutant that poses the greatest health to human health globally, others include carbon monoxide, nitrogen oxides (NO_x), sulphur oxides (SO_x), lead, and ozone.

Exposure indicators provide only a partial view of air pollution severity and consequences aggregated across the entire population. Importantly, there is generally no “safe level” of exposure for many pollutants. Even where guideline or target exposures are met, substantial public health and economic benefits can be realised through further improvements in air quality. Better estimates are needed for exposure to both outdoor and indoor air pollution. The accuracy of exposure estimates varies considerably by location. Accuracy is poorer in areas with few monitoring stations and in areas with very high concentrations. Particular attention should be paid to exposure of sensitive groups and the impact on human health (and associated distributional and equity issues). Although many important gaps remain, available data are improving.

Welfare costs only account for mortality, while impacts stemming from air pollution and their associated costs are more widespread, including morbidity, and costs associated to non-human health impacts.

Exposure and cost indicators can be usefully complemented with indicators of subjective well-being related to perceived air quality.

Energy mix

Recent trends and developments

Total energy supply (TES) in the LAC region remains dominated by fossil fuels (69% of TES in 2020), although renewables account for a much larger share (30%) than in the OECD area (12%) and the world (15%) (IEA, 2023[29]). The share of coal in the energy mix has been decreasing across the region, but many LAC countries still depend on coal for their energy supply; examples include Chile (18% in 2021), Brazil (8%), Colombia (6%) and Mexico (4%). Nuclear energy is hardly used in the region (IEA, 2023[29]).

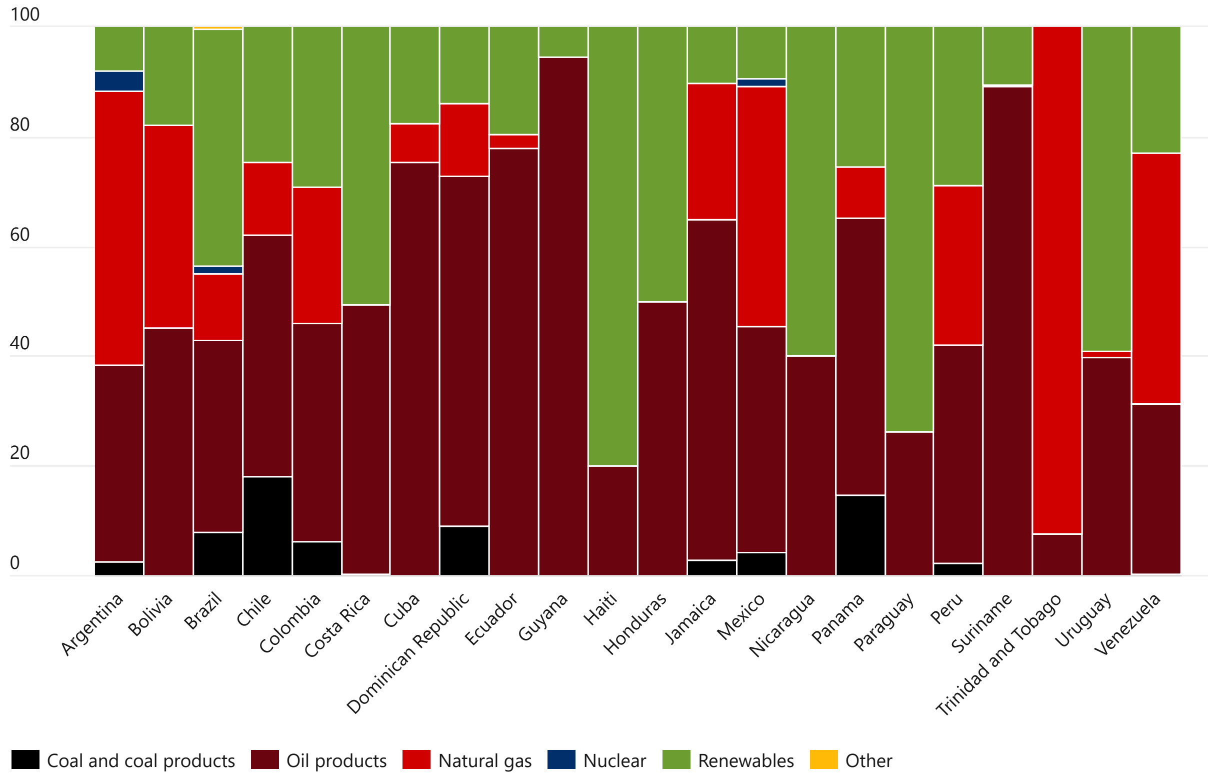
The use of renewables varies across the region. In some countries, such as Brazil, Costa Rica, Haiti, Honduras, Nicaragua, Paraguay and Uruguay, their share in the energy mix is over 40% while it is below 10% in Argentina, Guyana, Mexico and Trinidad and Tobago (Figure 14). The main sources of renewable energy are hydroelectric power and biofuels, such as firewood and bagasse (OECD et al., 2022[5]) (IEA, 2021[35]). In 2020, hydroelectricity accounted for 26% of total renewable energy supply across LAC. It played a larger role in South America (30%) and Central America (13%), than in the Caribbean (1%) due to islands' hydrological conditions and the relatively high cost of the infrastructure required.

In 2020, renewable energy accounted for 69% of electricity generation in the region, an increase of 9 percentage points since 2015. This is more than twice the OECD average of 30%. Most renewable electricity comes from hydroelectricity (78%) (IEA, 2022[10]). The remaining 22% come from solar, wind, biomass and geothermal (IEA, 2022[10]). Central America has shown the greatest increases in the share of renewables in electricity generation, from 65% to 77% between 2000 and 2020. However, significant variations exist across the region. While Brazil generates 84% of its electric power from renewables, Jamaica relies on imported oil derivatives for 87% of its electricity generation (OECD et al., 2022[5]).

Since hydroelectricity plays a major role in the region, there is a significant risk that changing rainfall patterns and increasing droughts affect the capacity of energy systems to adapt. In Chile extended droughts have already affected the country's hydropower capacity.

Figure 13. Energy supply mix

Percentage of total energy supply, 2021

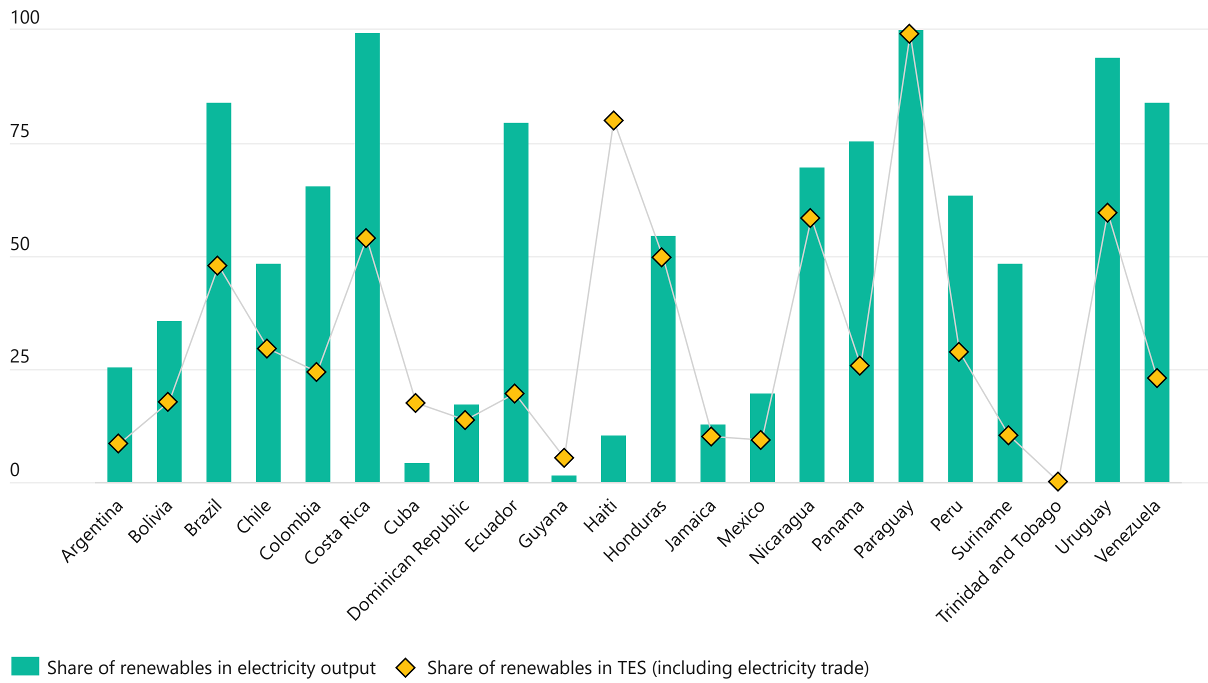


Compare: [Link to the dashboard.]

Source: OECD calculations based on IEA, "World energy statistics", IEA World Energy Statistics and Balances (database), https://doi.org/10.1787/data-00510-en.

Figure 14. Share of renewables in electricity output and total energy supply

Percentage, 2020



Compare: [Link to the dashboard.]

Source: OECD, "Green growth indicators", OECD Environment Statistics (database), https://doi.org/10.1787/data-00665-en, based on IEA data.

Comparability and interpretation

Data quality is not homogeneous for all countries. In some countries, data are based on secondary sources, and where incomplete estimates were made by the International Energy Agency (IEA). In general, data are likely to be more accurate for production and trade than for international bunkers or stock changes; and statistics for biofuels and waste are less accurate than those for traditional commercial energy data. The supply structure, which may vary considerably across countries is dependent on final demands by industry, transport and the household sectors, and is highly influenced by national energy policies and endowments in energy resources.

Climate change adaptation - Impacts and risks

Key messages

- Thirteen of the fifty countries most affected by climate change worldwide are in LAC where socio-economic vulnerability is compounded by a strong interdependence with the environment.
- Between 2001 and 2022 the number of extreme climate-related weather events in the region increased by 62%, and exposure of people, ecosystems and infrastructure to climate-related hazards is growing.
- People are increasingly exposed to heat stress. The surface temperature in 2021 was 0.6°C higher than the 1981-2010 average, and 9% of the population in LAC was exposed to more than two weeks of hot summer days, a 3% increase compared to 1979. The most affected country is Paraguay with nearly 90% of its population exposed, compared to only 28% in 1979.
- Cropland is increasingly exposed to heavy rain. In 2020, on average 6.9% of cropland was exposed to more than one week of extreme precipitation, an increase from 5.2% in 2000. In some countries such as Suriname, Guyana, and Trinidad and Tobago, this share reached 64%, 59%, and 29% respectively. These extreme precipitations trigger crop destruction, landslides, or other extreme events.
- The intensity of droughts is rising. Soil moisture on croplands decreased on average by 2.5% between 1981-2010 and 2017-2021. Anomalies in soil moisture on croplands affect primarily South America, although they are present in almost all LAC countries.
- Almost a third of LAC forest areas are exposed to wildfires. In some countries such as Jamaica, Paraguay, Mexico and El Salvador over 70% of the forest area is exposed. The proportions are smaller in Brazil and Venezuela (46% and 40% respectively), but the areas exposed are large due to the size of these countries.
- Tropical cyclones are a major hazard in the Caribbean. Belize and Mexico are also at risk, with more than 50% of their population and built-up area exposed to extreme tropical cyclones.
- The region's rich biodiversity is under high pressure from human activities and climate change, and biodiversity loss is a major concern. The region has made progress in taking measures to protect its biodiversity and landscapes. The 2020 Aichi targets to protect at least 17% of terrestrial and inland water, and 10% of coastal and marine areas, were achieved for the region as a whole, however, often under the least stringent protection levels. Further efforts are needed to reach the Global Biodiversity Framework target of the CBD to conserve and manage 30% of the national territory including terrestrial, inland water, and coastal and marine areas by 2030.

Context

Climate change has significant impacts on the environment, the economy and human welfare. It threatens ecosystems and biodiversity, affects water resources, human settlements and the frequency and scale of extreme weather events, with subsequent effects on food security, human well-being, socio-economic activities and output.

Some climate-related impacts will gradually affect economic processes, such as those associated with rising temperatures and sea levels, while others may be more acute and periodic such as the increased intensity and frequency of extreme weather events and other climate-related hazards. All have the potential to exacerbate socio-economic inequalities. Climate-related hazards put populations and economic assets at risk through more frequent and severe hot temperature extremes, marine heatwaves, heavy precipitation, droughts, intense tropical cyclones and reductions in Arctic Sea ice, snow cover and permafrost. Additional threats include wildfires, coastal floods, and sea-level rises (IPCC, 2021[36]).

Climate change is closely interconnected with biodiversity (IPBES and IPCC, 2021[37]). Environmental changes driven by climate change are disturbing natural habitats and species in many ways, adding to the threats to biodiversity from human activities. This in turn intensifies the effects of climate change, which cause biodiversity loss. The loss of biological diversity reduces ecosystem resilience and increases vulnerability to climate-related threats. For example, wildlife corridors across the Amazon, the Andes and the Patagonia play an essential role in the sequestration of carbon, and yet are being threatened by the warming that they serve to avoid (Samaniego et al., 2021[38]).

Policy challenges

The main challenge is to adapt and manage current and future risks from climate change, protect vulnerable populations, strategic infrastructure, and enable the restoration of environmental and other assets that have been lost or degraded. This implies:

- Integrating adaptation concerns into economic and sectoral policies, and effectively integrating climate and biodiversity policies.
- Encouraging investments in technologies, products and natural assets that help reduce the impact of climate change and build resilient infrastructures.
- Reforming and removing environmentally harmful subsidies and strengthening the role of biodiversity-relevant taxes, fees and charges, as well as other economic instruments such as payments for ecosystem services, biodiversity offsets and tradable permits (such as transferable quotas for fisheries).
- Implementing nature-based solutions (NbS) that can achieve synergies across NDCs and the National Biodiversity Strategies and Action Plans of the Global Biodiversity Framework (GBF), and that aim at adapting to or reducing climate change risks while ensuring human well-being and biodiversity benefits.
- Helping coastal communities adapt to the risks stemming from rising sea levels, extreme weather events and flooding.

Measuring progress and performance

Progress and performance can be assessed against domestic objectives and international goals and commitments on climate change and biodiversity.

Climate change adaptation is part of the 2030 Agenda for Sustainable Development (New York, September 2015) under Goal 13 "*Take urgent action to combat climate change and its impacts"* with targets related to the resilience and adaptive capacity to climate-related hazards and natural disasters in all countries and to education, awareness-raising and human and institutional capacity on climate change adaptation, impact reduction and early warning.

The UNFCCC requested specific commitments associated with adaptation plans. At COP27 in Sharm el-Sheikh (6-18 November 2022) Parties decided to establish a Loss and Damage fund for countries vulnerable to droughts, floods, rising sea level and other disasters attributed to climate change, which is particularly relevant for the Caribbean islands. At the time of writing, no decision has been reached on the sources or recipients of such funding.

The main international agreement on **biodiversity protection** is the Convention on Biological Diversity (CBD) that entered into force on 29 December 1993. It has three main objectives: (1) The conservation of biological diversity; (2) The sustainable use of the components of biological diversity; (3) The fair and equitable sharing of the benefits arising out of the utilization of genetic resources. At their 15th Conference in Montreal (December 2022), Parties adopted the Kunming-Montreal GBF. Among the Framework's key elements are 4 goals for 2050 and 23 targets for 2030. Targets for 2030 include the effective conservation and management of at least 30% of terrestrial and inland water areas, and of marine and coastal areas; the reduction of nutrients lost to the environment by at least half, pesticides by at least two thirds; the elimination of discharges of plastic waste; and the reduction of harmful incentives for biodiversity by at least 50 billion USD per year.

Biodiversity is also an integral part of the 2030 Agenda for Sustainable Development under Goal 15 *"Protect, restore and promote sustainable use of terrestrial ecosystems, sustainably manage forests, combat desertification, and halt and reverse land degradation and halt biodiversity loss", and under* Goal 14 *"Conserve and sustainably use the oceans, seas and marine resources for sustainable development".*

Indicators

The indicators presented in this section describe selected climate hazards and their inter-connection with biodiversity:

- Number of climate-related hazards that regions are prone to experience;
- Annual surface temperature change; population exposure to hot summer days and to tropical nights;
- Welfare cost from exposure to high temperatures;
- Cropland exposure to extreme precipitation events;
- Soil moisture anomaly in cropland;
- Forested areas exposed to fire danger;
- Land exposure to cyclones;
- Population and built-up area exposure to river flooding;
- Terrestrial and marine protected areas.

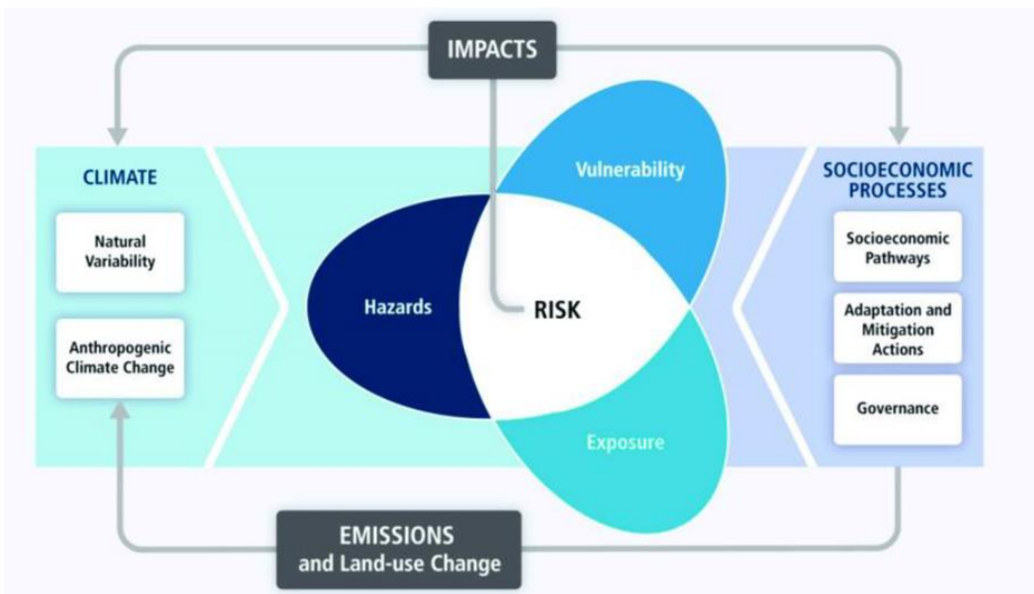
The indicators build on data available for most LAC countries. These data derive from work on climate hazards carried out under the International Programme for Action on Climate (IPAC) (see below) and from work on protected areas drawing on the World Database on Protected Areas (WDPA) maintained by UNEP-WCMC.

Exposure to climate hazards

Measurement framework

To track the most significant impacts of climate change and inform adaptation policies, the OECD has developed a database and a first set of indicators to monitor climate-related hazards and exposure to these hazards (Maes et al., 2022[39]). The indicator set is based on the IPCC conceptualisation of climate risk, which considers climate-related hazard, exposure and vulnerability as the key dimensions (Figure 15).

Figure 15. Conceptual illustration of key risk dimensions linked to climate-related impacts



Source: IPCC, 2014. A more elaborate version of this figure is available in AR6 Working Group II (IPCC, 2022[40]) and detailed descriptions for each dimension are available in (Maes et al., 2022[39]).

A climate-related hazard is a “potentially damaging climate-related physical event, phenomenon, or human activity that may cause the loss of life or injury, property damage, social and economic disruption or environmental degradation” (UNDRRR, 2020[41]). Climate-related hazards can include both sudden onset hazards (i.e. event-driven hazards such as heatwaves or cyclones) and slow onset hazards (i.e. long-term changes in the mean and variability of climate patterns such as mean precipitation or temperature).

The indicators can help identify and understand the impacts of climate-related hazards and the exposure of people and assets to these hazards in LAC, with focus on seven types of natural hazards that are influenced by climate change: (1) extreme temperature, (2) extreme precipitation, (3) drought, (4) wildfire, (5) wind threats, (6) river flooding and (7) coastal flooding (Maes et al., 2022[39]).

Recent trends and developments

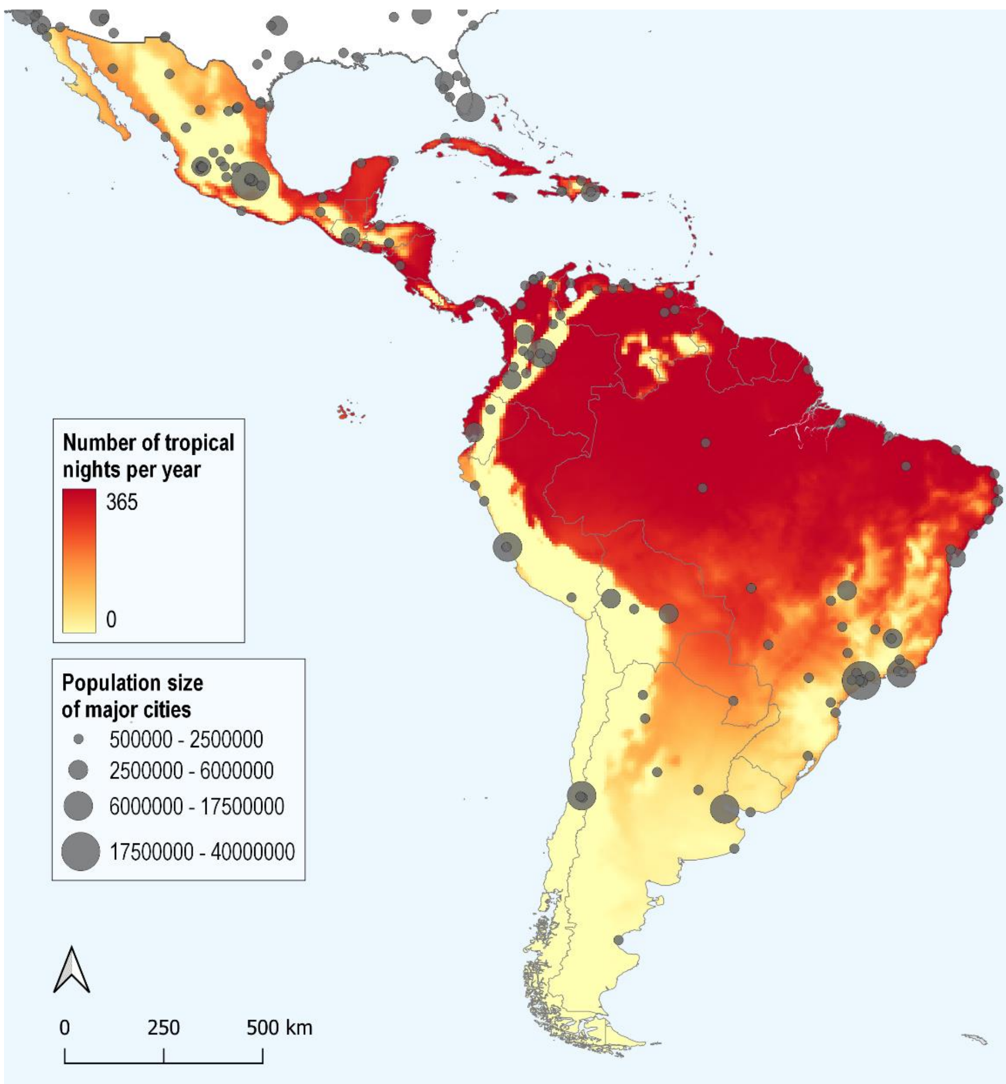
Climate change impacts are particularly acute in LAC where the very close socio-economic relationship with natural resources and the environment makes countries more vulnerable to climate change. Warming temperatures, and extreme precipitation events that lead to floods, landslides and droughts, sea level rise, coastal erosion, ocean acidification, and storm surges are expected to become more frequent and intense, with serious adverse socio-economic consequences on the region (OECD et al., 2022[5]).

The region is disproportionately affected by the consequences of climate change. Thirteen of the fifty countries most affected by climate change worldwide are in the region (German Watch, 2021[42]). Around 18% of the more than 11 thousand climate-related extreme weather events registered in the world between 1970 and 2019, occurred in LAC (WMO, 2021[43]). The average number of extreme climate-related weather events in LAC increased by 62%, from 0.55 events per year during the period 1980-2000 to 0.89 during the period 2001-2022 (EM-DAT, 2023[44]).[11]

Knowing the areas that are most affected by climate-related hazards helps countries focus their adaptation, recovery and emergency actions where they are most needed. Figure 16 presents one such hazard, notably, heat stress caused by tropical nights where the minimum temperature exceeds 20°C.

Figure 16. A large share of the LAC region is exposed to high levels of heat stress caused by tropical nights

Yearly number of tropical nights (2017-21 average) and population density across the LAC region



Note: Tropical nights are defined as nights where the minimum temperature exceeds 20°C.
Source: Maes, M., et al. (2022), "Monitoring exposure to climate-related hazards: Indicator methodology and key results", OECD Environment Working Papers, No. 201, OECD Publishing, Paris, https://doi.org/10.1787/da074cb6-en.

Click here to explore climate related hazards by region and sub-region

Temperature change

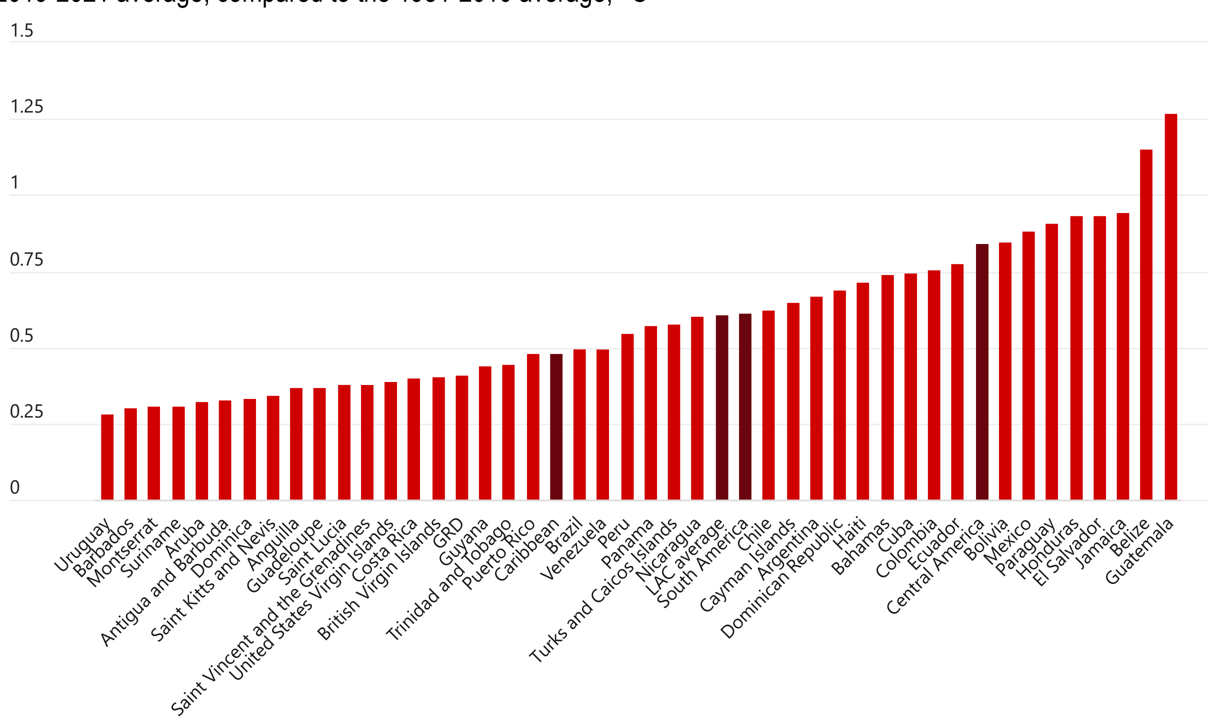
Over the past decades, population exposure to heat stress has increased significantly. In 2019-21, LAC countries experienced an average increase in surface temperature of around 0.6°C compared to the 1981-2010 average. Temperature increases were higher in Central America (+0.85°C on average) and more modest in the Caribbean (0.5°C). Guatemala and Belize experienced the highest increases of over 1°C. (Figure 17). Average temperature increases, however, often do not clearly express the impact of heat stress on human livelihoods. One option is to track average daily temperature over a certain time period and to define a "hot summer day" as one with temperature above 35°C to give an indication of heat stress. In 2021, about 9% of the population in LAC countries was exposed to more than 2 weeks of hot summer days, a 3% increase since 1979. This average, however, masks important national variations. For example, nearly 90% of Paraguay's population is exposed to more than 2 weeks of hot summer days, compared to only 28% in 1979 (Figure 18).

For tropical countries, high temperatures are best represented by the prevalence of tropical nights. In 2021, 77% of the population in the Caribbean was exposed to at least 2 weeks of tropical nights (measured as a minimum temperature above 20°C) (Figure 19).

High temperatures and heat waves impact human health in various ways. They are associated with increased mortality due to, among others, ischaemic heart disease, stroke, hypertensive heart disease, diabetes, respiratory infections and obstructive pulmonary diseases. Between 1990 and 2019, the estimated number of heat-related premature deaths has increased from 18 to 23 deaths per million inhabitants across LAC. This is more than three times the OECD average of 7 premature deaths in 2019. Countries such as El Salvador, Barbados, Paraguay, Grenada, Belize, Brazil, Cuba, Colombia, Jamaica, and Haiti stand above the LAC average. The associated welfare cost represents about 0.23% of GDP, more than twice the OECD average (of 0.06%) (Figure 20).

Figure 17. Annual surface temperature change

2019-2021 average, compared to the 1981-2010 average, °C

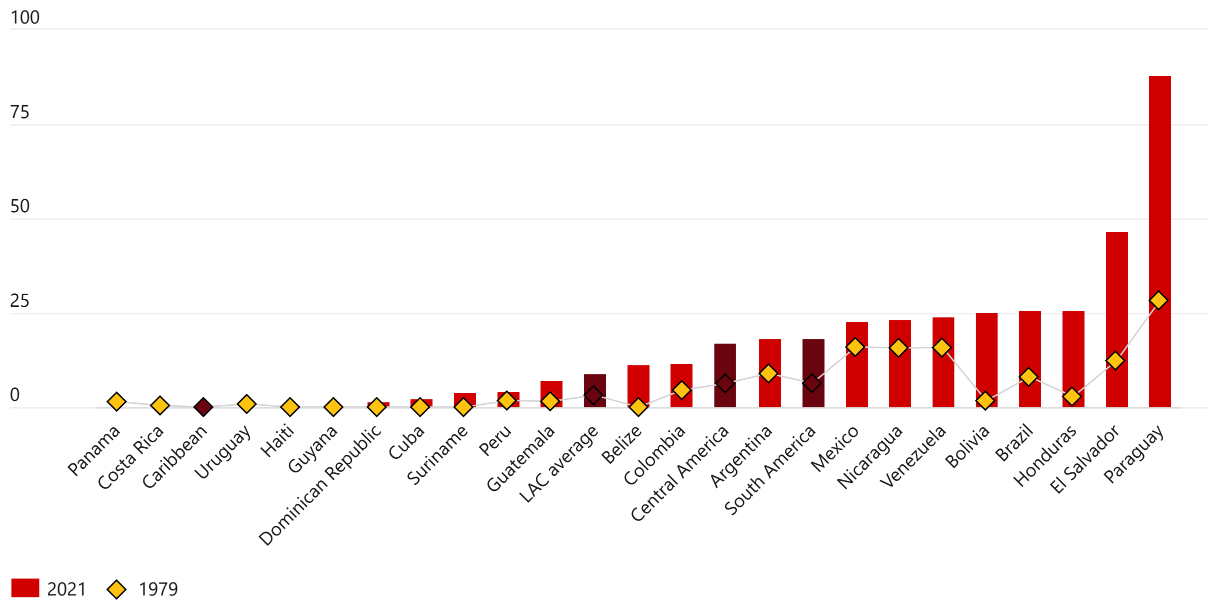


Compare: [Link to the dashboard.]

Source: IEA/OECD (2022), " Climate-related hazards: Extreme temperature", Environment Statistics (database), https://oe.cd/dx/4TF.

Figure 18. Population exposure to hot summer days

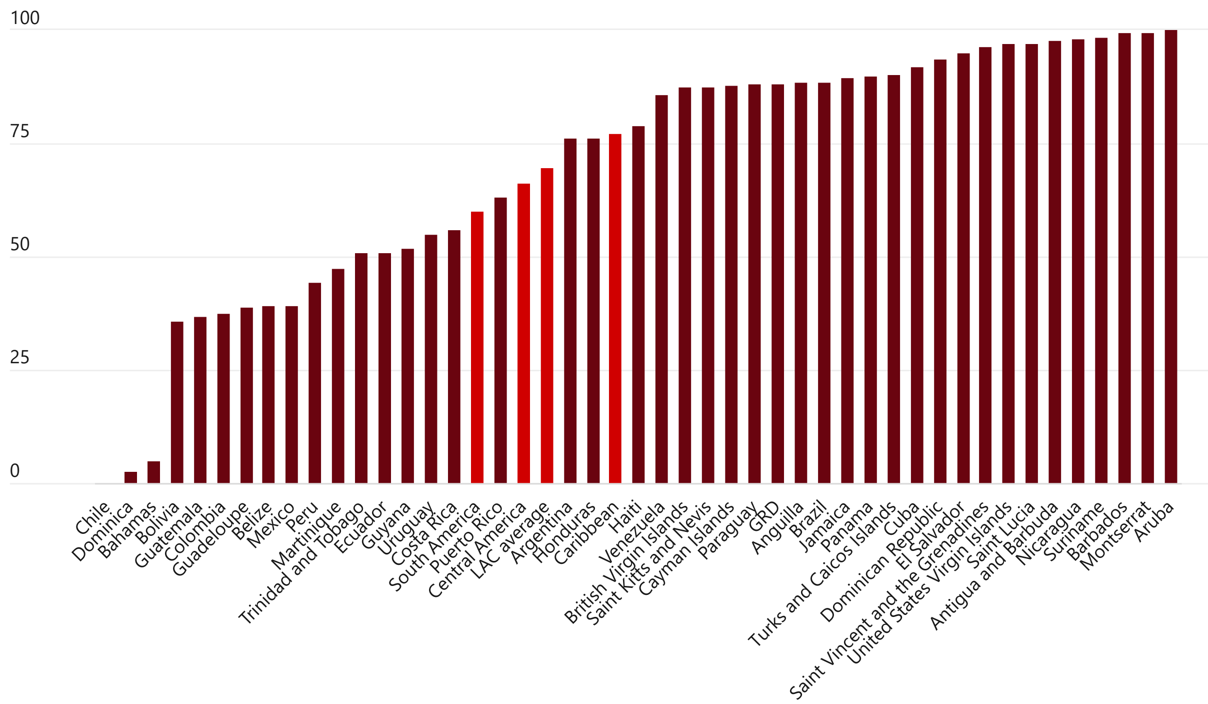
Percentage of population exposed to more than 2 weeks of hot summer days, 2021 (3-year moving average)



Compare: Link to the dashboard.
Note: Due to the resolution of the raw data, it is possible that heat stress for small islands is slightly underestimated. There are also several additional indicators to describe heat stress (such as the UTCI (Universal Thermal Climate Index), which also takes moisture, wind and solar radiation into account); these should be kept in mind for a more thorough analysis of exposure to heat for single countries.
Source: IEA/OECD (2022), " Climate-related hazards: Extreme temperature", Environment Statistics (database), https://oe.cd/dx/4TF.

Figure 19. Population exposure to tropical nights

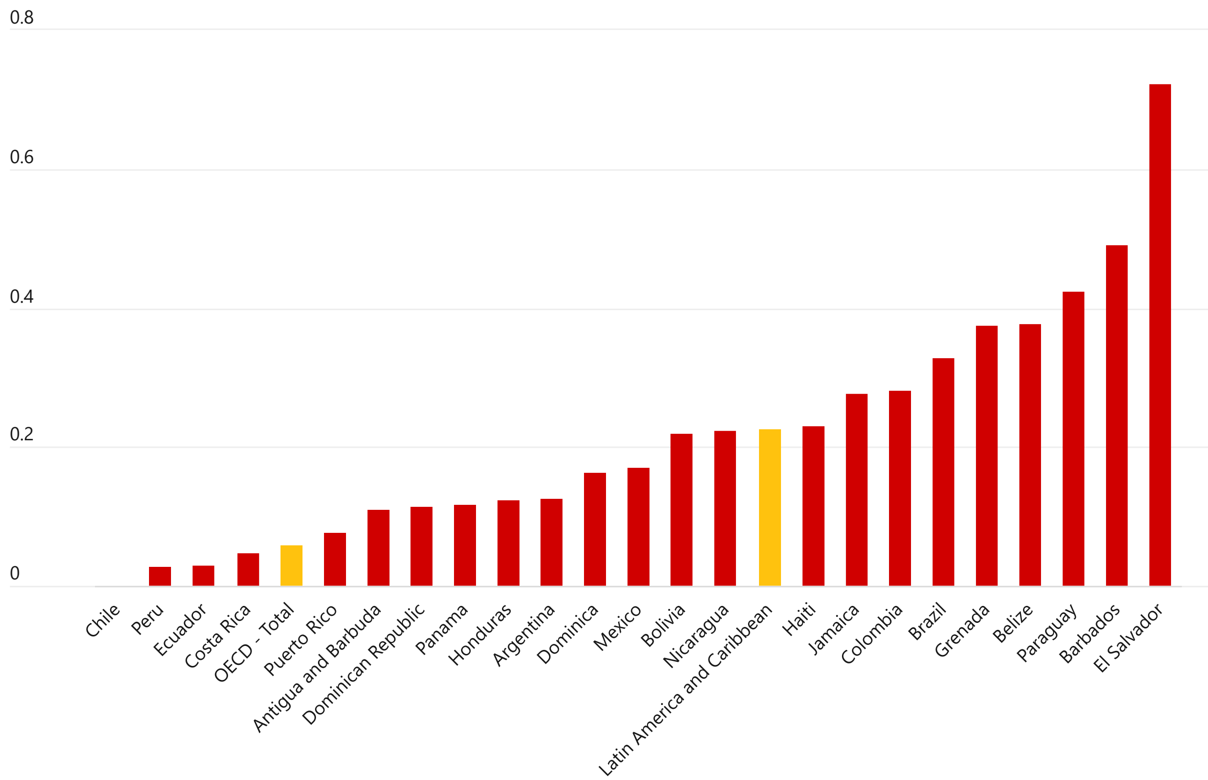
Percentage of population exposed to more than 2 weeks of tropical nights, 2021 (3-year moving average)



Compare: Link to the dashboard.
Note: Due to the resolution of the raw data, it is possible that heat stress for small islands is slightly underestimated. There are also several additional indicators to describe heat stress (such as the UTCI), which also takes moisture, wind and solar radiation into account); these should be kept in mind for a more thorough analysis of exposure to heat for single countries.
Source: IEA/OECD (2022), " Climate-related hazards: Extreme temperature", Environment Statistics (database), https://oe.cd/dx/4TF.

Figure 20. Welfare cost from exposure to high temperatures

Percentage of GDP equivalent, 2019



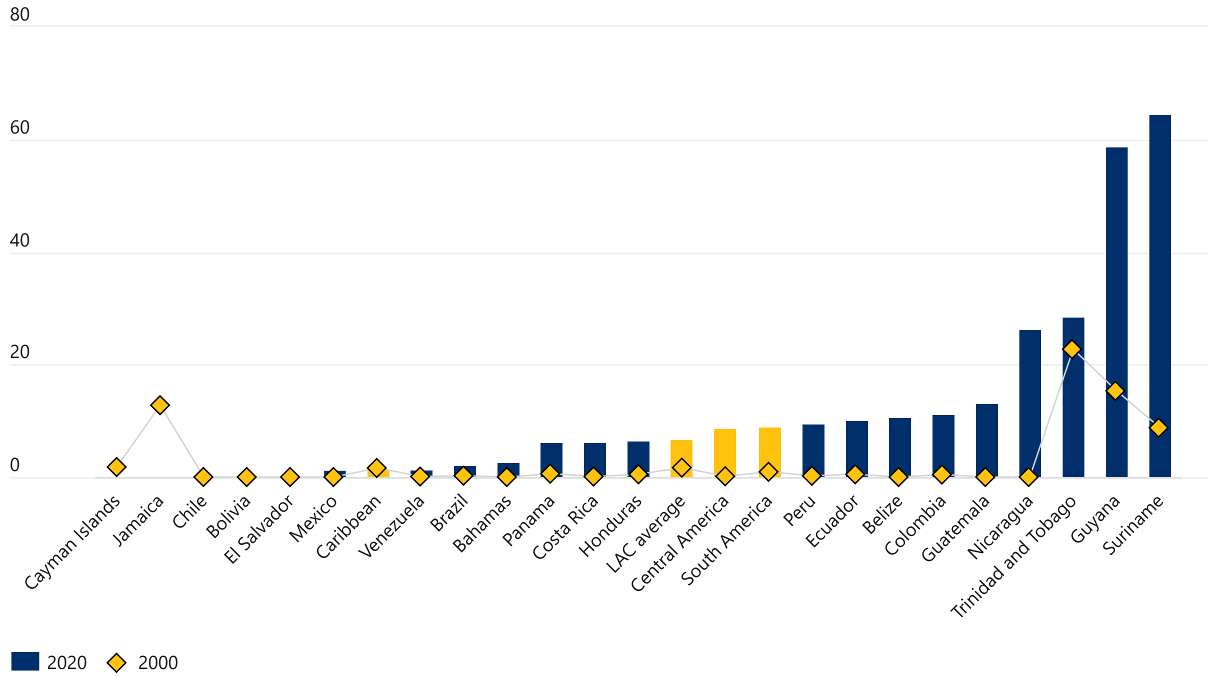
Compare: Link to the dashboard.
Source: OECD (2023), "Air quality and health: Mortality and welfare cost from exposure to air pollution", OECD Environment Statistics (database), https://doi.org/10.1787/c14fb169-en.

Extreme precipitation

Countries that depend on agricultural production are more vulnerable to rising temperatures combined with extreme rainfall events. Many LAC countries are experiencing an increase in extreme precipitation, which can trigger the destruction of crops, landslides, or other extreme events. In 2020, LAC countries had 6.9% of their cropland exposed to more than one week of extreme precipitation (i.e. precipitation exceeding the 99^{th} percentile of the reference period 1981-2010), compared to 5.2% in 2000. In some countries such as Suriname, Guyana, and Trinidad and Tobago, this share is much higher (64%, 59%, and 29% respectively). A few countries experienced a significant increase since 2000, including Surinam, Guyana, Nicaragua and Guatemala (Figure 21).

Figure 21. Cropland exposure to extreme precipitation events

Average annual percentage of cropland exposed to more than one week of extreme precipitation, 2020 (3-year moving average)



Compare: [Link to the dashboard.]()
Source: IEA/OECD (2022), " Climate-related hazards: Extreme precipitation", Environment Statistics (database), https://oe.cd/dx/4TG.

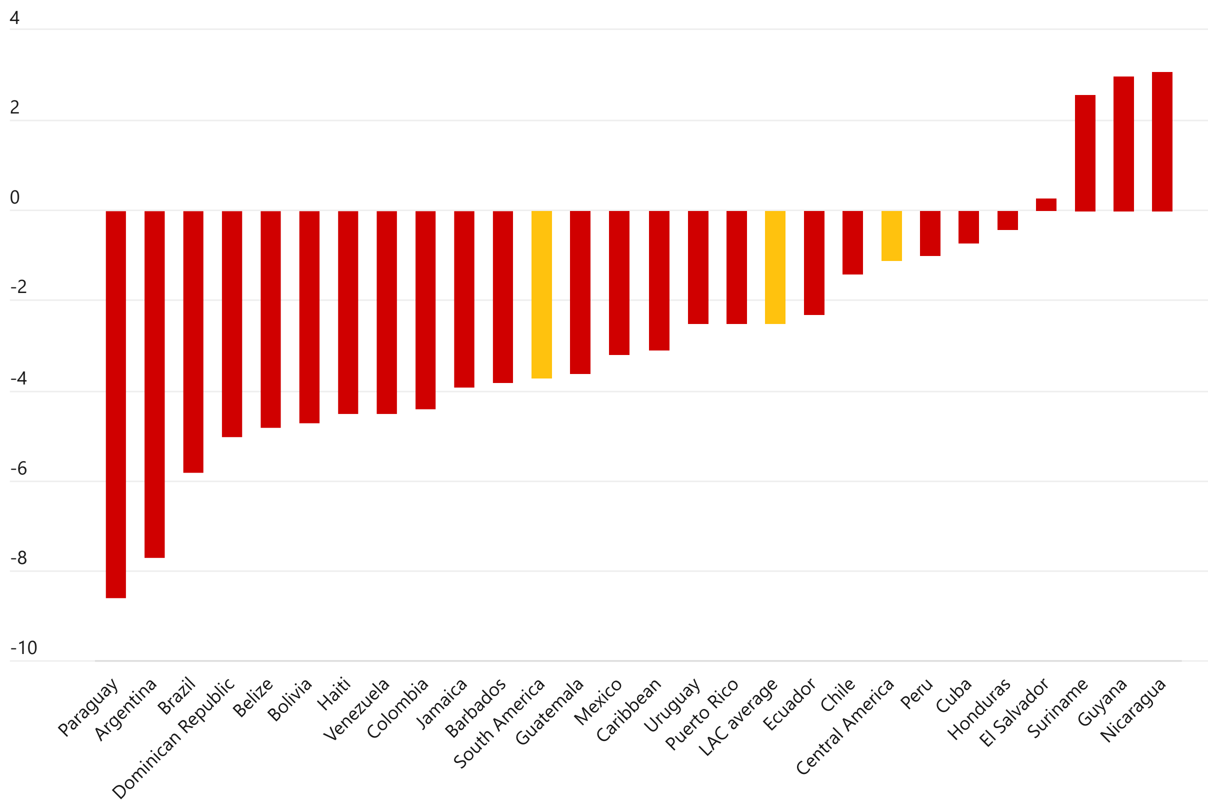
Droughts

For many years, South America has been affected by severe droughts and poor water availability. In Central America available freshwater resources per capita are projected to decrease by at least 82% by 2100 compared to 2005, while total rainfall is expected to decrease by 11% by 2050 (ECLAC, 2010[45]). These developments are expected to impact agricultural productivity and raise concerns over food security (IPCC, 2022[40]).

Across LAC countries cropland soil moisture, which is used to monitor the intensity of droughts, decreased on average by 2.5% between the periods 1981-2010 and 2017-2021. Anomalies in cropland soil moisture affect primarily South America, although almost all LAC countries experience a decline. The countries most affected by droughts are Paraguay, Argentina, and Brazil, which experienced a decline in cropland soil moisture of more than 8.6%, 7.7%, and 5.8% respectively (Figure 22).

Figure 22. Soil moisture anomaly on cropland

Percentage change, 2017-2021 average, compared to the reference period 1981-2010



Compare: [Link to the dashboard.]
Source: IEA/OECD (2022), " Climate-related hazards: Drought", Environment Statistics (database), https://oe.cd/dx/4TH.

Wildfires

Wildfires are an increasing concern for LAC countries. The danger of wildfires has grown in the past decade driven by high temperatures and increased incidence of drought in many areas (Hartinger et al., 2023[46]). For example, in summer 2023 (January-February), Chile experienced wildfires that generated significant losses of life and infrastructure.

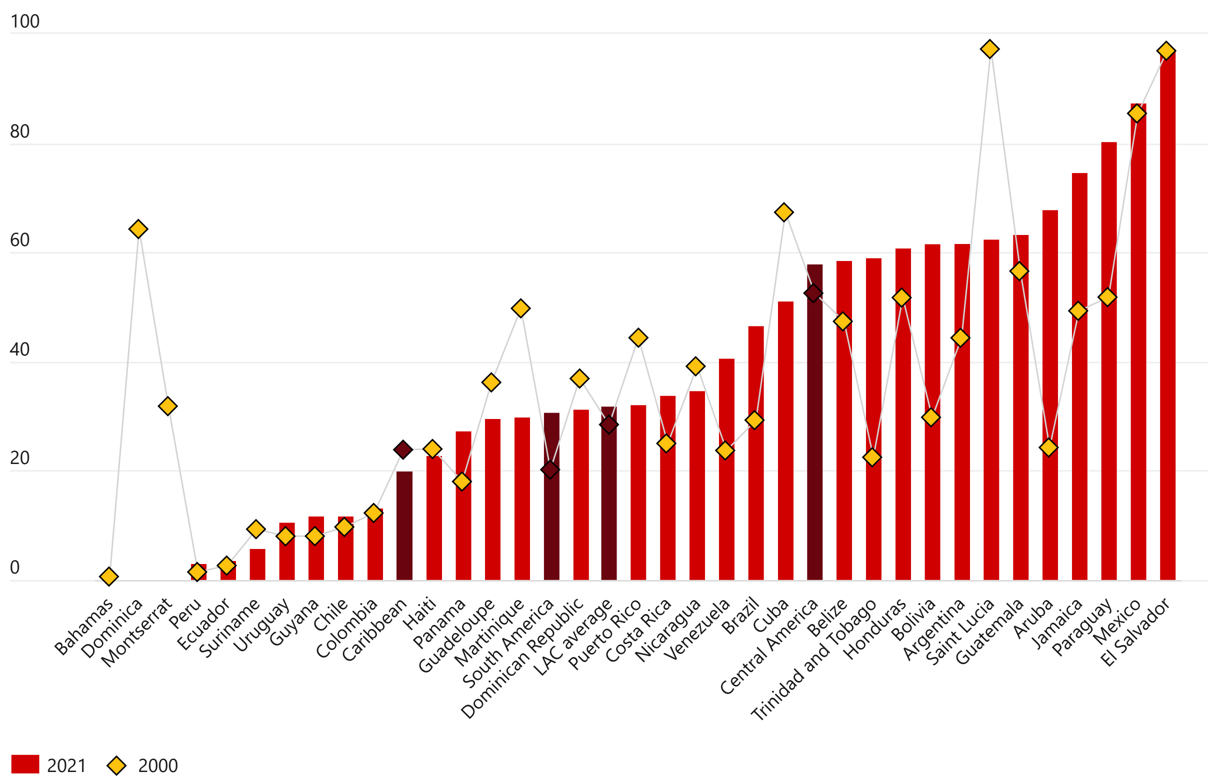
The region is endowed with unique and diverse biomes, where wildfires have an important role in the ecosystem dynamics, such as in the Brazilian Cerrado. The Amazon rainforest biome however is not adapted to exposure to fire during the life cycle of its plant species and has a relatively low resilience to wildfires. This vulnerability is further exacerbated by land use change and deforestation (Hartinger et al., 2023[46]).

The forested area exposed to wildfire danger in LAC is very large, 32% on average, which puts people and ecosystems at risk. In some countries such as Jamaica, Paraguay, Mexico and El Salvador, over 70% of the forested area is exposed to wildfire risks. The proportions are smaller in Brazil and Venezuela (46% and 40% respectively), but the areas exposed are large because of the size of these countries. They cover over 2.2 million km^2, an area larger than the size of Mexico (Figure 23).

Wildfires can lead to severe forest and biodiversity losses. This is of particular concern in South America that holds 21% of the world's forests, including the Amazon, the Pantanal and El Chaco. In the Amazon, continued deforestation and wildfires reduce the ability of the forest to act as carbon sinks and, combined with climate change, could lead to a non-reversible tipping point in the Amazon ecosystem that could become a non-forest ecosystem. This would in turn affect the Amazon's hydrological cycle, which is fundamental for economic activity and broader wellbeing in Brazil and adjacent South American countries (Hartinger et al., 2023[46]).

Figure 23. Forested areas exposed to fire danger

Percentage of forested areas exposed to very high and extreme fire danger for more than three consecutive days, 2021 (3-year moving average)



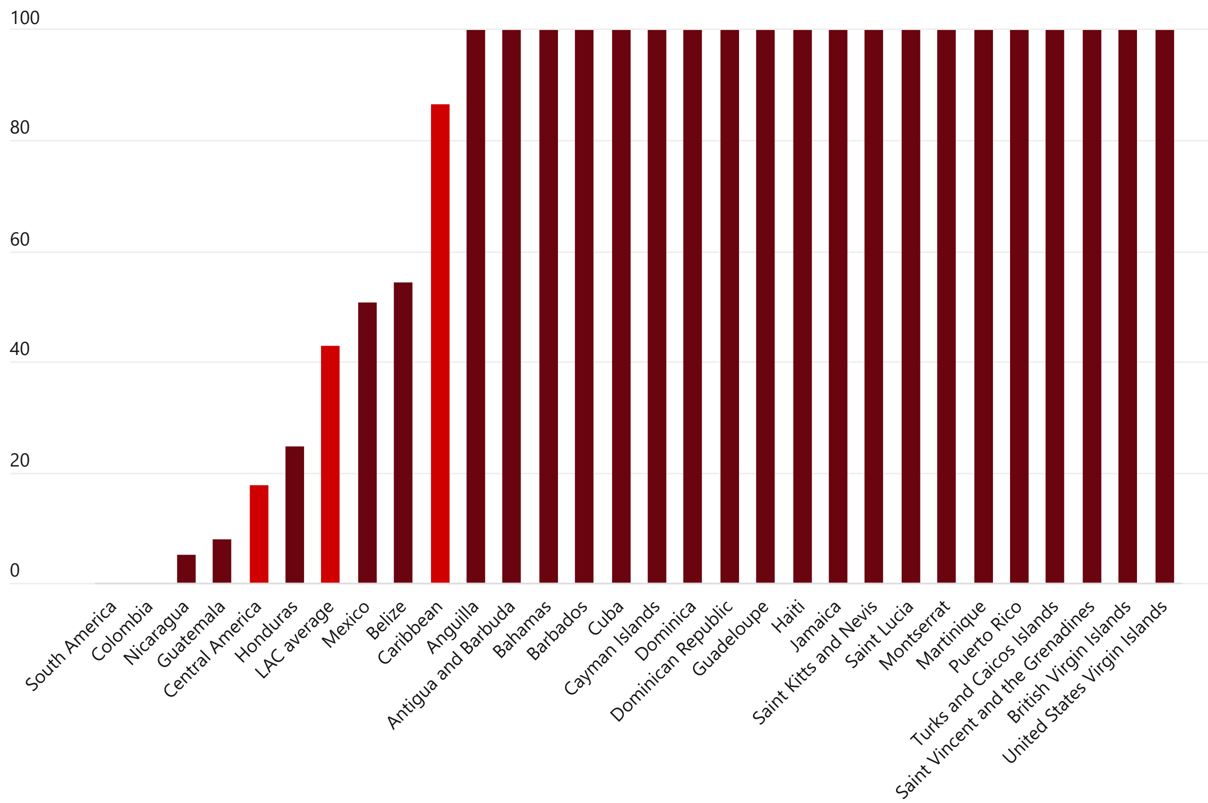
Compare: Link to the dashboard.
Source: IEA/OECD (2022), " Climate-related hazards: Wildfire", Environment Statistics (database), https://oe.cd/dx/4TI.

Wind threats

Climate change also exacerbates storms, which can lead to losses of human life, destroy infrastructure, and increase the costs of losses and damages, and of replacement and reconstruction. Tropical cyclones significantly affect a subset of LAC countries due to their geographic position. In the Caribbean, almost all countries are exposed to tropical cyclones. Belize and Mexico are also at risk, with more than 50% of their populations and built-up areas exposed to extreme tropical cyclones (Figure 24).[12] Between 2000 and 2019, an average of 17 hurricanes per year and 23 category-5 hurricanes were recorded, mostly in Caribbean and Central American countries (OCHA, 2020[47]).

Figure 24. Land exposure to cyclones

Percentage of land exposed to cyclones with a return period of 100 years, 2020



Compare: [Link to the dashboard.]

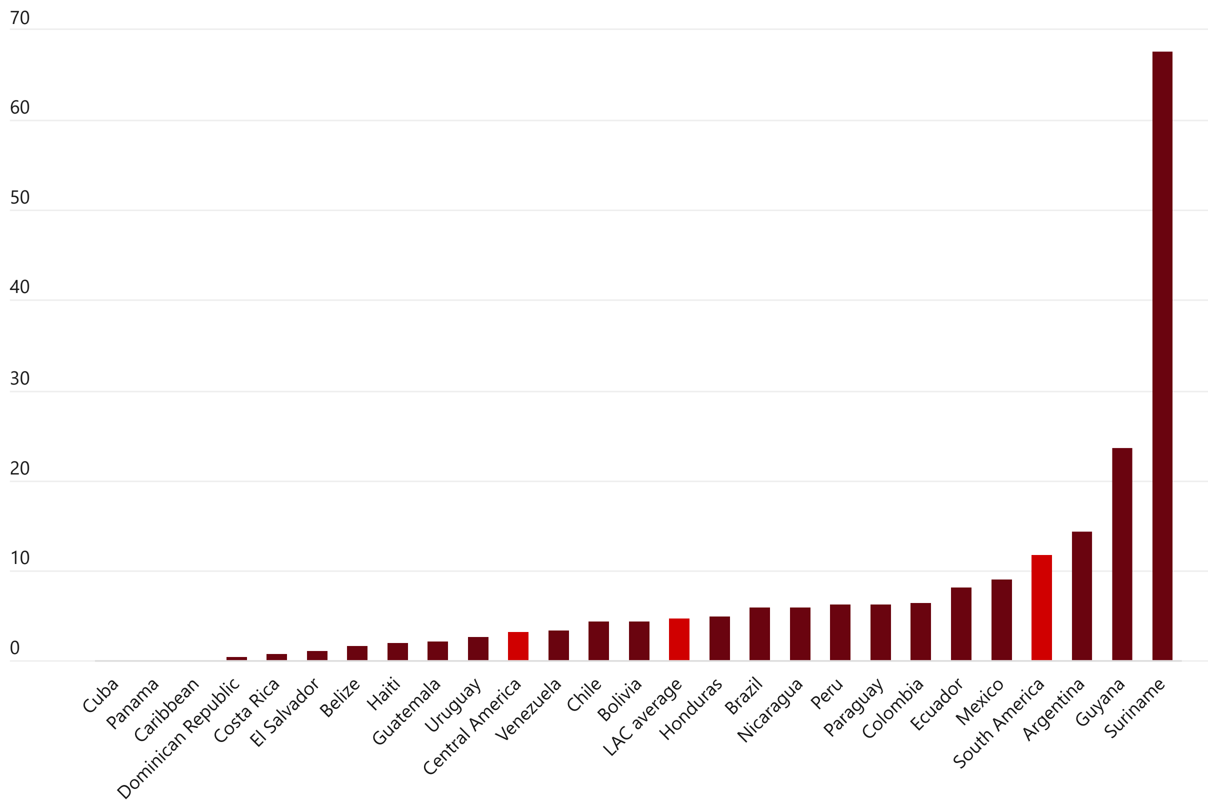
Source: IEA/OECD (2022), " Climate-related hazards: Wind threats", Environment Statistics (database), https://oe.cd/dx/4TJ.

River flooding

River flooding is not a major concern in the LAC region. On average, 5% of the population and 4% of buildings are exposed to risks of river flooding. Due to the presence of the Amazon river, which carries one-fifth of the world's freshwater (Ramos et al., 2023[48]), South America is the sub-region most vulnerable to river flooding, with about 12% of the population and 10% of the buildings exposed. The countries most exposed are Suriname, Guyana and Argentina (Figure 25 and Figure 26).

Figure 25. Population exposure to river flooding

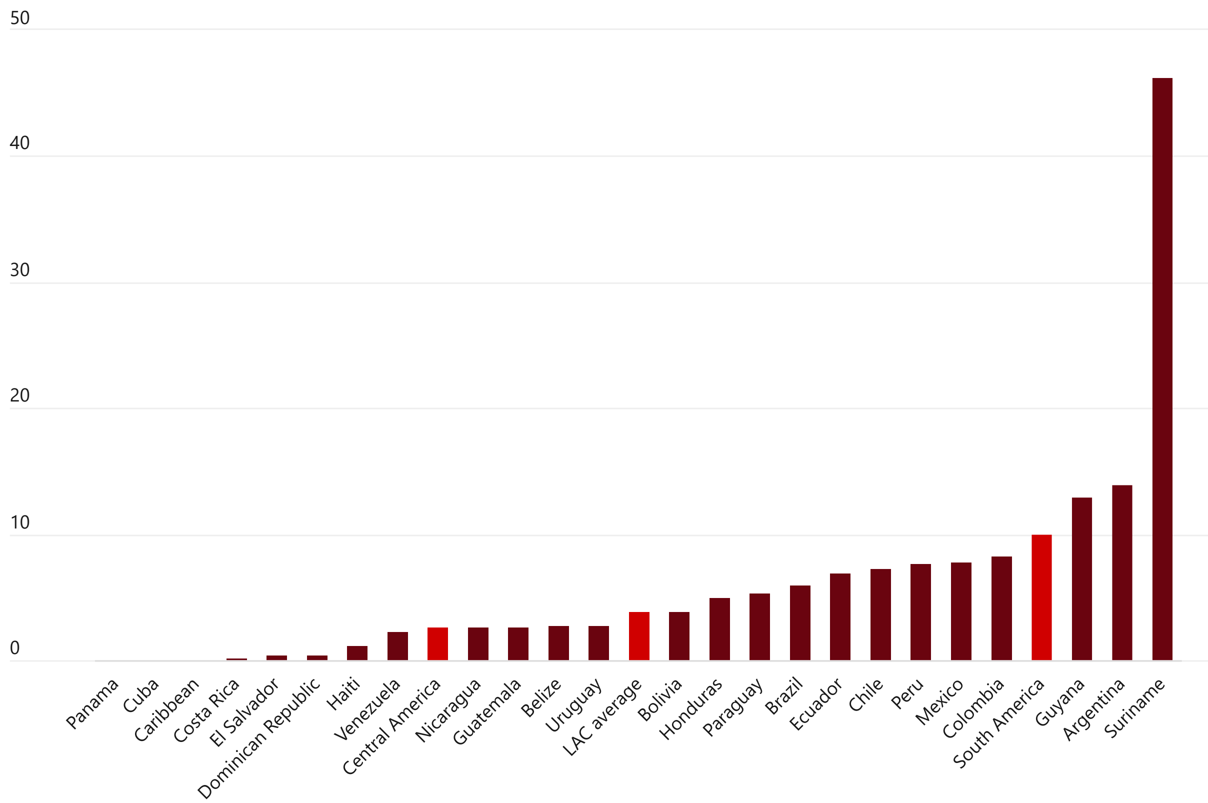
Percentage of population exposed to river flooding, with a return period of 100 years, 2020



Compare: [Link to the dashboard.]
Source: IEA/OECD (2022), " Climate-related hazards: River flooding", Environment Statistics (database), https://oe.cd/dx/4TK.

Figure 26. Built-up area exposure to river flooding

Percentage of built-up areas exposed to river flooding, with a return period of 100 years, 2020



Compare: [Link to the dashboard.]

Source: IEA/OECD (2022), " Climate-related hazards: River flooding", Environment Statistics (database), https://oe.cd/dx/4TK.

Box 3. The increasing cost of climate-related hazards in LAC

Worldwide, the costs of climate-related hazards put increasing pressures on public finances and can result in fiscal risks. Governments will face higher costs for relief, recovery and rebuilding of publicly owned building and infrastructure in the aftermath of more frequent or severe extreme events, as well as increased costs related to investing in adaptation. They will also face increasing demands for financial support from households, businesses and sub-national governments impacted by extreme events. The costs from natural disasters alone were estimated at USD 280 billion in 2021, representing approximately 0.29% of global GDP (Munich RE, 2022[49]).

Many LAC countries are already experiencing a fall in agricultural productivity and tourism, as well as climate-driven migration and high reconstruction costs after natural disasters. For example, in 2016 heavy rains in the Dominican Republic generated severe economic losses due to reduced crop yields, and during the 2017 hurricane season, an estimated loss of USD 52 million was recorded due to lower touristic activity. In Haiti and Puerto Rico, two of the three most affected areas in the world between 1999 and 2018, annual GDP losses reached 2.38% and 3.76%, respectively (OECD et al., 2022[5]). In 2019, hurricane Dorian caused economic impacts that are estimated at a quarter of the Bahamas' GDP (Zegarra, M. et al., 2020[50]).

For many LAC countries the fiscal capacity to deal with the increasing impacts of climate change is limited. For lower middle-income and low-income countries a natural disaster results on average in costs of 0.8% and 1.1% of GDP respectively, and in an increased fiscal deficit of 0.8% of GDP and 0.9% respectively (OECD et al., 2022[5]).

The costs of inaction may be even higher. In the Caribbean, the annual cost of inaction to deal with the effects of sea level rise could reach USD 22 billion per year by 2050 (10% of GDP) and USD 46 billion by 2100 (22% of GDP) (OECD et al., 2022[5]).

Comparability, interpretation and data availability

The climate hazard indicators presented are a selection of a broader set of indicators on climate-related hazards developed by (Maes et al., 2022[39]). They are based on data from official sources such as the Copernicus Climate Data Store (CDS), the National Aeronautics and Space Administration (NASA) and the Japan Aerospace Exploration Agency, among others. For a detailed discussion see (Maes et al., 2022[39]). All regional averages presented here are simple, non-weighted averages over the countries in the LAC region. They therefore do not consider differences in area or population and represent the exposure of an average LAC country to natural hazards, but not the actual share of land or population of the region that is exposed.

It is to be noted that vulnerability, an important dimension of disaster risk, is currently not measured because of limitations in data availability.

Climate impacts and biodiversity

The LAC region is home to about half of the world's biodiversity and holds one-third of global freshwater resources (OECD et al., 2022[5]). It hosts 23% of the world's forests, including the Amazon, the world's largest rain forest. Six of the world's 17 mega-diverse countries are located in Latin America, namely Brazil, Colombia, Ecuador, Mexico, Peru and Venezuela. Wildlife or green corridors, such as the Mesoamerican Biological Corridor, play an essential role in the sequestration of carbon globally. Many economic activities in LAC rely on the integrity and quality of its ecosystems and natural resources, including tourism, agriculture, fisheries and forestry. This dependence makes the region particularly vulnerable to biodiversity loss and climate-related impacts. Land use change, urban sprawl, deforestation, overexploitation and illegal trafficking of species, pollution from intensive agricultural practices, mining and climate change exert continued pressures on the natural environment causing habitat loss and fragmentation, and a degradation of ecosystem services. This in turn undermines the ability of ecosystems to provide a shield against growing climate-related risks and reduces their resilience to impacts of climate change.

The loss of biodiversity is a major concern for LAC (IPBES, 2018[51]). The Red List Index, which monitors the combined extinction risk for birds, mammals, amphibians, cycads and corals, has fallen by 3% since 2000 (average for 11 LAC countries), twice the rate observed across OECD countries. While Chile, Ecuador and Mexico have experienced the largest declines, every country in the region is considered to have "high-risk" rates of decline (OECD, 2021[52]).

Recent trends and developments

The region has made progress in taking measures to protect its biodiversity, its natural resources and the associated cultural resources. In 2022, it had 24% of its total land area (almost 5 million km^2) and 21% of its Exclusive Economic Zones (over 4 million km^2), designated as terrestrial and marine protected areas, respectively. (Figure 27). As a whole the region achieved the 2020 Aichi target to protect at least 17% of terrestrial and inland water areas, and 10% of coastal and marine areas. Progress remains to be done to achieve the GBF target of the CBD to conserve and manage 30% of the national territory including terrestrial, inland water, and coastal and marine areas by 2030.

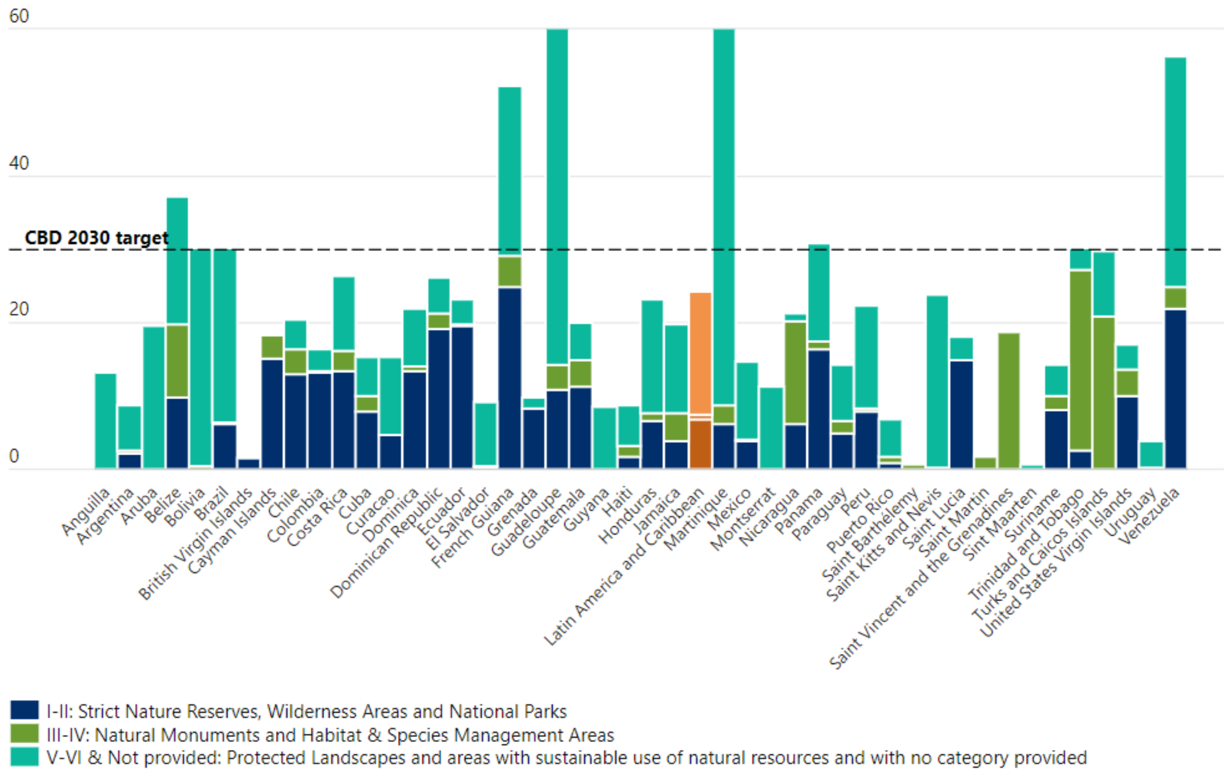
The share of terrestrial protected areas has increased steadily over the past few decades from an average below 5% in 1980. Countries driving the trend include Belize, Bolivia, Brazil, Guatemala, Panama, Trinidad and Tobago and Venezuela, all of which have surpassed the Aichi 2030 target. Nevertheless, most of these countries rely on the least stringent[13] protection categories (such as protected landscapes) rather than on strict nature reserves, national parks and wilderness areas (International Union for the Conservation of Nature [IUCN] categories I-II), which are usually more restrictive in the activities permitted.

Marine and coastal protected areas are less commonly designated throughout the LAC region, with 5 countries reaching already the 2030 GBF target. The share of marine protected areas increased slowly, remaining below 5% until 2015. The increase to 21% in 2022 was driven by the designation of large marine protected areas by Argentina, Brazil, Chile, Colombia, Mexico and Panama between 2015 and 2018. As for terrestrial areas, most marine areas are managed under less stringent protection categories. Only 10 territories designated strict nature reserves, national parks or wilderness areas (IUCN categories I-II).

Several LAC countries started to develop and implement nature-based solutions (NbS) to address climate change (EUROCLIMA, 2022[16]). NbS generally refer to a broad set of actions that protect, sustainably manage, restore, or modify ecosystems to address policy objectives such as climate change mitigation or adaptation while simultaneously providing biodiversity benefits. These have become increasingly important in climate action and countries are including them in the NDCs as part of their overall policy efforts. Twelve LAC countries explicitly mention NbS in their NDCs. For example, Paraguay's NDC proposes to "protect and restore wetlands and water sources"; Argentina is committed to "strengthen and expand national Protected Areas"; Costa Rica, the first tropical country to have reversed deforestation, is preparing a methodological guide for NbS in infrastructure; and Chile is planting 200 000 hectares of forest, a third of which with native species.

Figure 27. Terrestrial Protected Areas

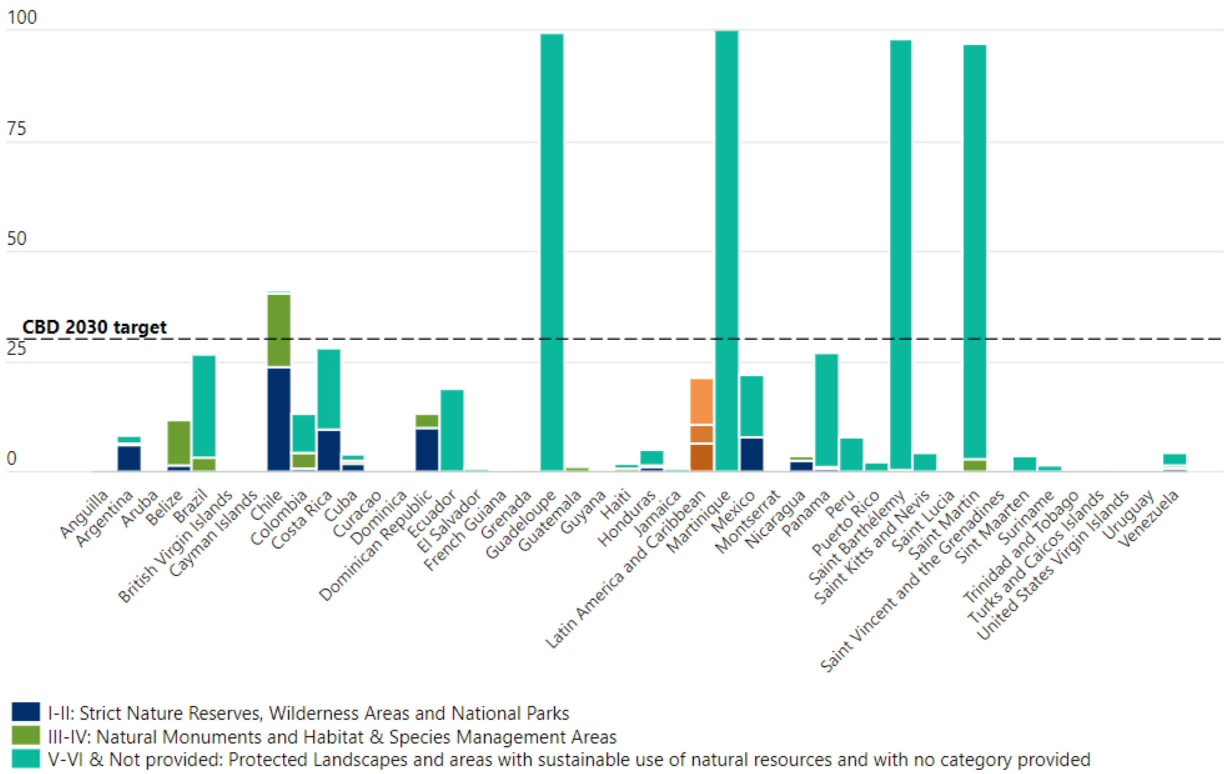
Percentage of total land area



Compare: Link to the dashboard.
Note: the CBD Global Biodiversity Framework establishes the “30x30” conservation target, calling for 30% of the earth’s land and sea to be conserved through the establishment of protected areas and other area-based conservation measures.
Source: OECD, “Biodiversity: Protected areas”, OECD Environment Statistics (database), https://doi.org/10.1787/5fa661ce-en.

Figure 28. Marine Protected Areas

Percentage of exclusive economic zone



Compare: Link to the dashboard.
Note: the CBD Global Biodiversity Framework establishes the "30x30" conservation target, calling for 30% of the earth's land and sea to be conserved through the establishment of protected areas and other area-based conservation measures.
Source: OECD, "Biodiversity: Protected areas", OECD Environment Statistics (database), https://doi.org/10.1787/5fa661ce-en.

Comparability, interpretation and data availability

Data on protected areas are available for most LAC countries. Although national classifications differ, the IUCN has developed internationally agreed definitions of protected areas, classifying them as: strict nature reserves and wilderness areas (I), national parks (II), natural monuments or features (III), habitat or species management areas (IV), protected landscapes or seascapes (V), and protected areas with sustainable use of natural resources (VI).

The extent and management types of terrestrial and marine protected areas indicate countries' efforts to safeguard habitats and species, as well as landscapes shaped by human-environment interactions that are valued for cultural or other reasons. Indicators on the extent of protected areas do however not reflect the effectiveness of the management of these areas. It is also to be noted that protected areas are not always representative of national biodiversity or sufficiently connected.

Climate actions and policies

Key messages

- Since the adoption of the Paris Agreement, LAC countries strengthened their climate action, but with different policy approaches. Mexico, Colombia, Chile and Argentina rely primarily on market-based instruments such as carbon pricing and subsidies, and feed-in tariffs for renewable energy; while others (Costa Rica and Peru) rely primarily on non-market-based instruments, such as minimum energy performance standards and bans or phase-outs of fossil-fuel equipment or infrastructure. Despite this progress, there is room for increased action and greater policy stringency.
- Although LAC countries expanded the use of environmentally related taxes, the revenue they raise remains modest (0.9% of GDP in 2020, less than half the OECD average of 2.1%). As in most other countries, the bulk of revenue is raised from taxing energy, in particular motor fuels, and transport.
- LAC countries have increased their use of carbon pricing, through fuel excise duties, and in some cases (Argentina, Chile, Colombia, Mexico, Uruguay), through explicit carbon taxes. In 2021 average net effective carbon rates were relatively low in most LAC countries. Costa Rica had the highest net ECR at EUR 47 per tCO_2e, followed by Jamaica at EUR 32.4 and Mexico at EUR 19.9.
- The highest net ECR is applied to the road transport sector, reaching, for example, EUR 121.8 per tCO_2e in Uruguay and EUR 116 in Costa Rica. Off-road transport and agriculture are the next most priced sectors, up to EUR 81.6 per tCO_2e and EUR 83.4 in Costa Rica, respectively.
- The share of GHG emissions priced varies from 80% in Jamaica to less than 20% in Argentina, Brazil, Colombia, Uruguay and Paraguay. All road transport emissions are subject to a positive net ECR in most LAC countries. Seven LAC countries price all emissions from off-road transport and agriculture and four countries price more than 98% of emissions from electricity generation.
- The revenue potential from increasing effective carbon prices and reforming fossil fuel support goes from less than 0.3% of GDP in Costa Rica, to above 3% of GDP in Argentina, Ecuador and Jamaica. This is due to higher pre-existing carbon prices or lower fossil fuel subsidies.
- Although LAC countries have reduced government support to fossil fuels between 2012 and 2019 (-32%), support more than doubled in 2021 with the rebound of the global economy. Support to fossil fuels is expected to increase further in 2022 as global consumption subsidies are anticipated to increase due to higher fuel prices and energy use.
- Scaling up financing instruments, such as green, social, sustainable and sustainability-linked bonds, debt-for-nature swaps, catastrophe bonds, and natural disaster clauses, can also help raise additional revenue to ensure flows of resources target climate action, as well as ESG ratings, Climate Risks Assessments and expenditure and finance taxonomies to complement the implementation of financing instruments.

- Countries such as Colombia, Mexico, Brazil, Costa Rica, Peru, the Dominican Republic, Cuba and Ecuador are recipients of aid targeted towards climate change mitigation, adaptation and biodiversity from DAC members. Climate change mitigation received the largest sums, followed by biodiversity and climate change adaptation.

Context

Environmental policy instruments are institutional vehicles through which policy makers implement policy objectives. They provide incentives to control or limit environmentally harmful activities or to promote beneficial ones through pollution abatement and control, cleaner technologies and innovation, and input or product substitution. They often operate as part of a “mix” where several instruments are applied to the same environmental issue to enhance their effectiveness and economic efficiency.

The transition to net-zero involves using the right policy levers and a combination of market-based and non-market-based instruments that is consistent with countries’ specific circumstances (see Box 4). Governments must align their climate objectives and actions across different policy domains including transport, housing, construction, spatial planning, agriculture and development co-operation. This is essential to ensure that other policies and measures do not hamper the effectiveness of climate policies, for example by providing support to fossil fuels. Governments must also consider the synergies between emission reduction and adaptation strategies, and the synergies with other environmental and broader well-being objectives such as biodiversity, cleaner air and improved health. Climate policies that are integrated with actions to reduce poverty and vulnerability are particularly important in the LAC region.

Progress and performance can be assessed by relating information on policies and policy instruments to their outcomes in terms of GHG emission reductions, improvements in air quality and biodiversity, and resilience to climate shocks, as well as by reviewing other non-environmental policy instruments for their unintended negative environmental impacts.

This section gives an overview of climate actions and policies in a subset of LAC countries where information is available, drawing on data from International Programme for Action on Climate. It also presents selected indicators on policy instruments for which data are available for most LAC countries: environmentally related taxes, net effective carbon rates and official development assistance for climate. The indicators displayed do not provide a complete overview of countries’ policies and policy mixes to achieve their climate-related objectives and their interpretation should consider the country specific contexts.

Box 4. Market-based and non-market-based policy instruments

Market-based instruments operate by affecting the relative prices of goods to incentivise or disincentivise certain behaviour, such as taxes, subsidies, emission trading schemes and climate finance instruments. Non-market-based instruments operate by providing mandates or standards to be enforced legally or through penalties, such as emission standards and permits, or by influencing behaviour indirectly through targets, information and education campaigns, and certification systems. These include instruments that are adopted to intentionally mitigate climate change and those that are adopted for other purposes (e.g. safety, energy affordability) but have effects on GHG emissions. Many of these instruments apply to economic activity sectors, the sub-national level and cities. Examples include the following:

- Governments can tax and subsidise in a way that drives decarbonisation, for instance by applying carbon taxes and cutting fossil fuel support that undermines the effectiveness of environmental policies.
- Governments can invest in innovation and new technology, efficient energy systems, resilient infrastructure and sustainable food and transport systems.
- Governments can regulate to control emissions and lead the way with greener public procurement.
- Governments can implement educational programmes and information campaigns to raise awareness and encourage businesses and consumers to act.

Overview of climate policies

Recent developments

It has been estimated that a 2.5°C global warming scenario could cost LAC between 1.5% and 5.0% of its GDP by 2050 (ECLAC, 2015[53]). Accelerated climate action is therefore needed. It should focus on measures to incentivise clean energy and energy efficiency, phasing-out fossil fuel subsidies and other support measures, decarbonising the transport sector, and reducing deforestation (OECD et al., 2022[5]).

The OECD has developed a monitoring framework and database to track climate mitigation policies across countries, called the Climate Actions and Policies Measurement Framework (CAPMF). It covers a subset of LAC countries, including Argentina, Brazil, Chile, Colombia, Costa Rica, Mexico and Peru (Box 5). These countries strengthened their climate action between 2015, when the PA was adopted, and 2020 in terms of both policy adoption and policy stringency, although individual countries progressed at different paces.

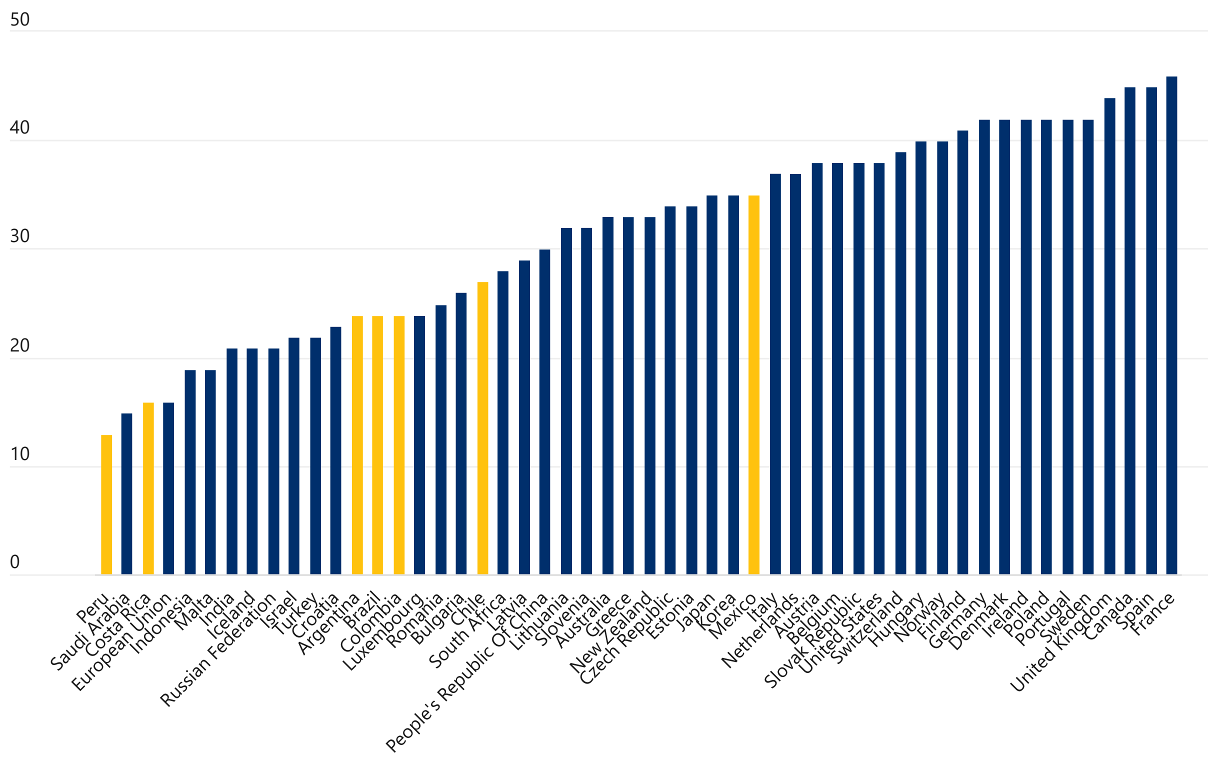
The number of policies adopted increased. The countries which have seen the largest increase in policy adoption are Argentina and Colombia, that introduced 9 and 7 new policies, respectively. In absolute terms, Mexico has the largest number of policies, boasting 35 (out of 56 policies covered by the CAPMF) registered policies in 2020, followed by Chile with 27, Argentina, Brazil and Colombia with 24, Costa Rica with 16 and Peru with 13 policies.

Some countries rely primarily on market-based instruments, such as Mexico, Colombia, Chile and Argentina where carbon pricing and subsidies and feed-in tariffs for renewable energy abound. Other countries, such as Costa Rica and Peru, rely primarily on non-market-based instruments, such as minimum energy performance standards and bans or phase-outs of fossil-fuel equipment or infrastructure.

While policy coverage and policy stringency do not measure effectiveness, they provide an initial assessment. In LAC, despite progress made since 2015 and the long-term ambition announced by many countries, policies and actions on climate remain insufficient. There is space for countries to enhance the effectiveness of their policy mixes and to strengthen policy stringency, defined as the degree to which climate actions and policies incentivise or enable GHG emissions mitigation at home or abroad.

Since countries have different emission profiles, drivers, and socio-economic constraints, there is no one-size-fits-all policy approach. Differences between countries reflect the complex interactions between climate ambitions, pre-existing conditions, political and institutional constraints and social preferences. At the same time, in an interconnected world, differences in climate ambition and policy adoption can lead to competitive disadvantages for ambitious countries, which ultimately may slow down climate action (Figure 29). Countries must choose the best policy mix and instruments for effective climate action in the context of their national circumstances. A whole-of-government approach dealing with economic development and poverty issues may be necessary to overcome institutional and socio-economic barriers.

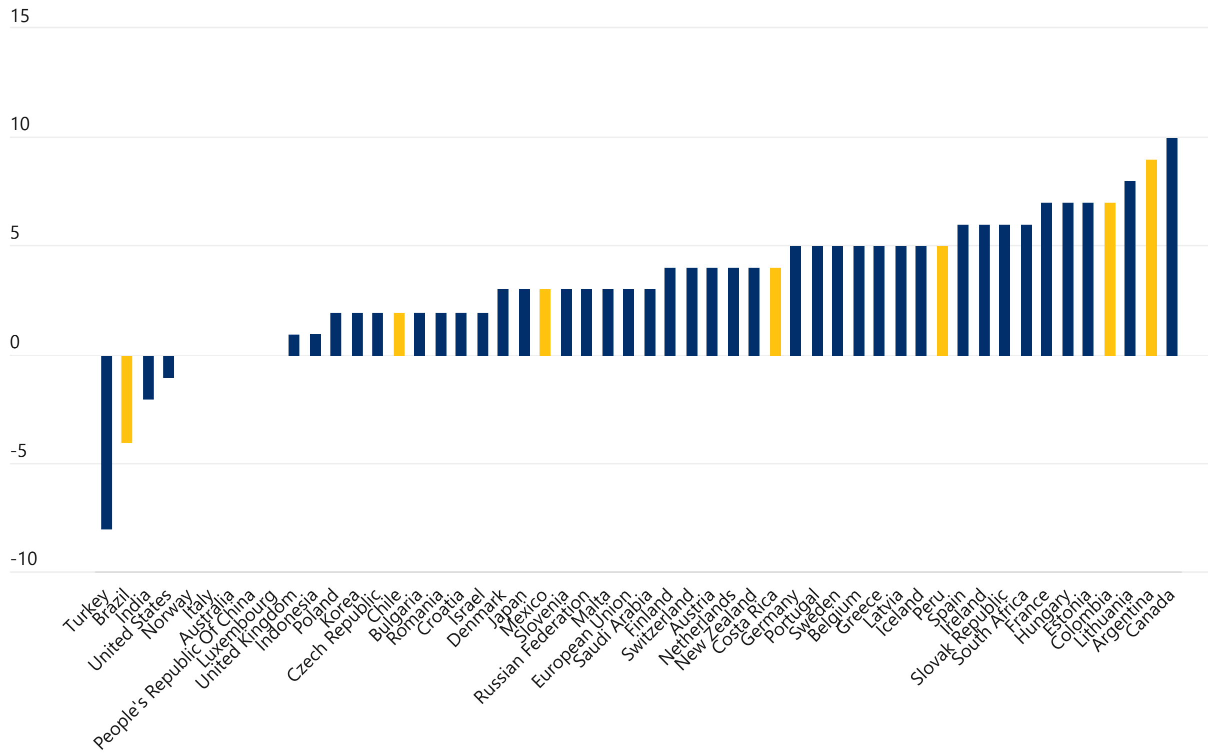
Figure 29. Number of climate actions and policies in 2020



Compare: [Link to the dashboard.]

Source : Nachtigall, D., et al. (2022), "The climate actions and policies measurement framework: A structured and harmonised climate policy database to monitor countries' mitigation action", OECD Environment Working Papers, No. 203, OECD Publishing, Paris, https://doi.org/10.1787/2caa60ce-en.

Figure 30. Change in adopted climate policies between 2015 to 2020



Compare: [Link to the dashboard.]

Source : Nachtigall, D., et al. (2022), "The climate actions and policies measurement framework: A structured and harmonised climate policy database to monitor countries' mitigation action", OECD Environment Working Papers, No. 203, OECD Publishing, Paris, https://doi.org/10.1787/2caa60ce-en.

Box 5. The Climate Actions and Policies Measurement Framework (CAPMF)

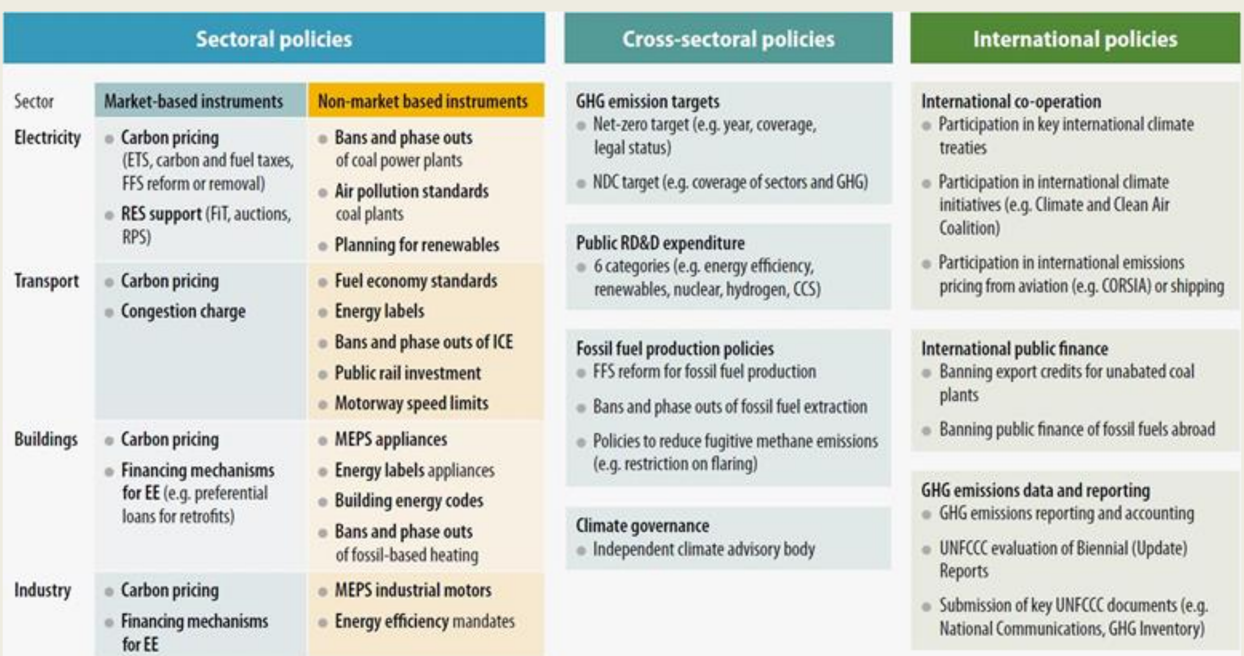
The CAPMF is a harmonised climate-mitigation policy database. It was developed by the OECD under the International Programme for Action on Climate) as part of a broader effort to develop indicators to support evidence-based policy analysis and government decision-making in the climate change policy-sphere. The CAPMF can help countries monitor climate actions and support national and international policy analysis.

The CAPMF includes climate mitigation actions and policies coherent with UNFCCC and IPCC frameworks. It is the most comprehensive, harmonised climate policy database to support countries to implement their NDCs and enable analysis on policy effectiveness. It covers:

1. Broad range of policies: 128 policy variables, grouped into 56 policy instruments and other climate actions.
2. Country Coverage: 51 countries and EU27, accounting for 85% of global greenhouse gas (GHG) emissions, including: Argentina, Brazil, Chile, Colombia, Costa Rica, Mexico, and Peru.
3. Time Series: 2000-2020 period.

All data are publicly available. Policymakers and practitioners can explore the data and the policy insights at https://oecd-main.shinyapps.io/climate-actions-and-policies/.

Figure 31. Climate Actions and Policies Measurement Framework



Environmentally related taxes and financial instruments

Recent trends and developments

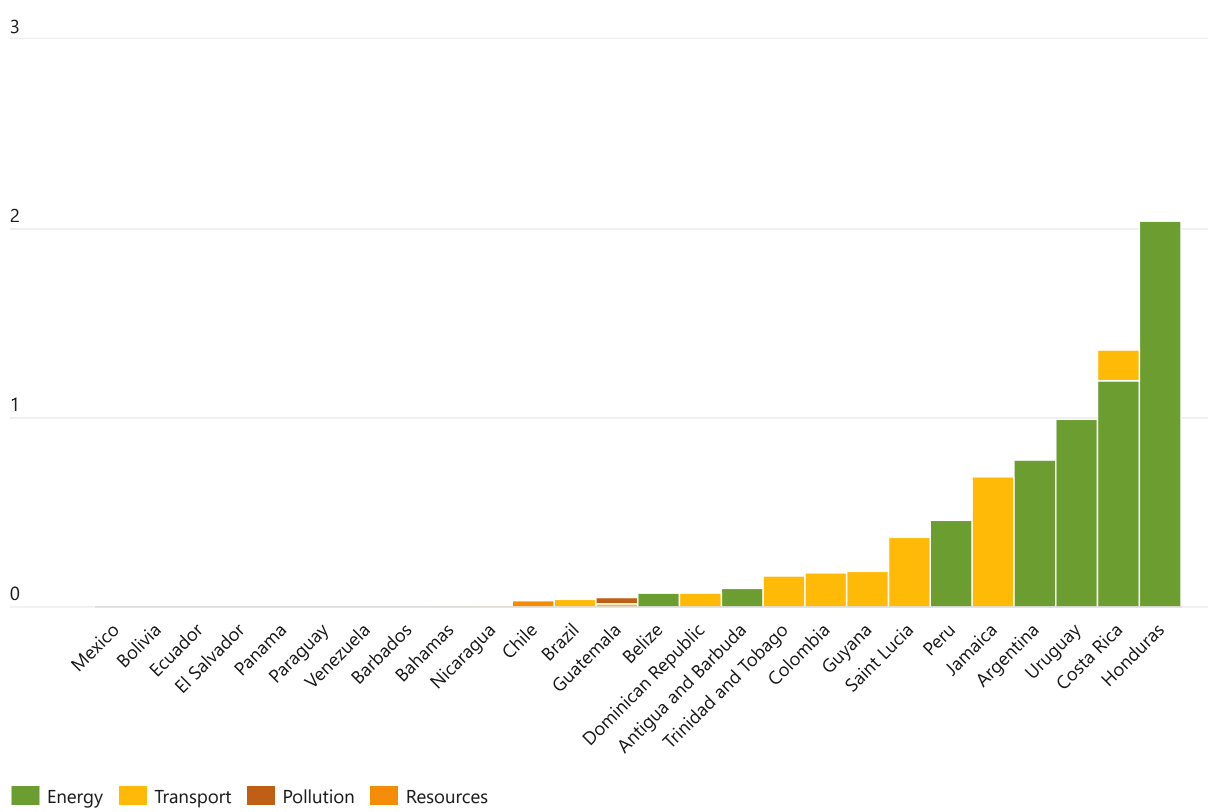
The LAC region faces the challenge of financing the green transition under a tight fiscal space. In addition there is a risk of reduced future income due to the region's dependence on exports of GHG intensive products whose demand is projected to shrink over the next two decades (UNDP, 2022[54]). Governments thus need to find new ways to mobilise additional revenues. One approach is to implement instruments that simultaneously incentivise behavioural change and that can capture additional income, such as environmentally-related taxes, emission trading systems (ETS) and other financial instruments.

Tax revenue in LAC countries remains low, accounting for about 21.9% of GDP in 2020, compared to 33.5% in the OECD (OECD et al., 2022[5]). This gap is explained by the region's relatively low revenue from income taxes and social security contributions (OECD et al., 2022[5]). Environmentally related taxation provides an alternative income source to increase tax revenue and achieve environmental objectives. In recent years, LAC countries made increasing use of environmentally related fiscal instruments. Mexico introduced a carbon and fertiliser tax, Colombia a tax on plastic bags, Chile a carbon tax and a tax on local air pollution. These are positive developments. However, there is room for increasing the rates and broadening the coverage of these instruments. Revenue from environmentally related taxes in LAC amounted to only 0.9% of GDP on average in 2020, less than half the OECD average of 2.1% of GDP. As in most countries, the bulk of the revenue is raised from taxing energy, in particular motor fuels, and transport; pollution and resource tax bases play a minor role (Figure 32; Figure 33).

Furthermore, scaling up tools of debt, such as green, social, sustainable and sustainability-linked (GSSS) bonds, debt-for-nature swaps, catastrophe bonds, and natural disaster clauses, can also help raise additional revenue and ensure flows of resources target climate action. The GSSS market in the region reached an accumulated USD 73 billion from 2014 to September 2021, of which green bond issuance accounted for USD 31 billion, followed by social with USD 17 billion (OECD et al., 2022[5]). Other measures such as Environmental, Social and Governance (ESG) ratings, Climate Risks Assessments and expenditure and finance taxonomies, increasingly adopted in the region, can support and encourage the implementation of such instruments (S&P Global, 2022[55]).

Figure 32. Environmentally related tax revenue, percentage of GDP

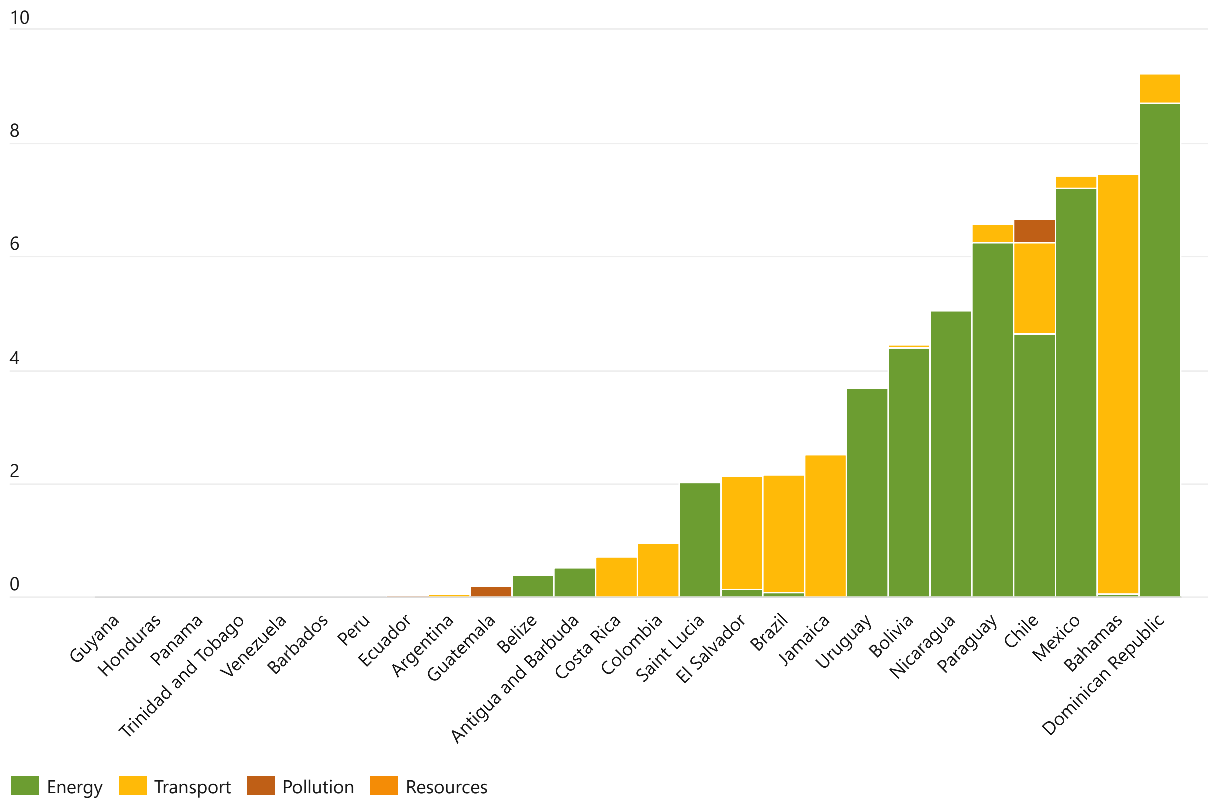
Breakdown by tax base, 2020



Compare: Link to the dashboard.
Source: OECD, "Policy Instruments for the Environment (PINE) Database", http://oe.cd/pine.

Figure 33. Environmentally related tax revenue, percentage of total tax revenue

Breakdown by tax base, 2020



Compare: Link to the dashboard.
Source: OECD, "Policy Instruments for the Environment (PINE) Database", http://oe.cd/pine.

Comparability, interpretation and data availability

Environmentally related taxes can have important environmental impacts even if they raise little (or no) revenue. However, indicators on environmentally related taxes should be used with care when assessing the "environmental friendliness" of the tax systems. For such analyses, additional information, describing the economic and taxation structure of the country, is necessary. For example, information on revenue from fees and charges, and from royalties related to resource management may be relevant but is not included.

Comparisons of environmentally related tax revenue provide a useful starting point for analysing the impact of environmental taxation, however, comparing only the levels of revenue does not provide the full picture of a country's environmental policy, as it does not provide information on tax rates, exemptions or coverage. The OECD Policy Instruments for the Environment (PINE) database provides additional information on tax rates and exemptions, allowing a more comprehensive assessment of the environmental impacts of these taxes. In addition, governments may choose to implement environmental policy using a range of other instruments, including fees and charges, expenditures (both direct and subsidies) and regulation, some of which are also detailed in the PINE database (see http://oe.cd/pine for information on the use of alternative instruments in countries).

Carbon pricing

Recent trends and developments

Carbon pricing is an important policy instrument that encourages decarbonisation efforts and can accelerate the transition to net-zero. As part of their efforts to cut GHG emissions, LAC countries have increased their use of carbon pricing through the implementation of carbon taxes. Although considered by many LAC countries, Emission Trading Systems are yet to be implemented. Most countries, however, have adopted carbon pricing implicitly using fuel excise taxes. A good measure of carbon pricing is effective carbon rates (ECR) that consider the price on carbon emissions arising from fuel excise taxes, carbon taxes, and tradeable carbon emission permits. In the region, effective carbon pricing is most commonly applied in the road transport sector, followed by agriculture and fisheries, off-road transport, industry, buildings and the electricity sector.

Explicit carbon rates

Explicit carbon taxes have only recently been implemented in the region, at low rates and with limited coverage. Chile applies an explicit carbon tax of EUR 4.18 per tCO_2e to power generation, but does not tax the transport and building sectors, this implies an average explicit carbon tax of EUR 1.40 per tonne of CO_2, for all national emissions, which is the highest in the region. Argentina, Colombia and Mexico apply explicit carbon taxes mainly in the transport and agriculture sectors, with average explicit carbon taxes of EUR 0.73, EUR 0.79 and EUR 1.16 respectively over their total national emissions. These differences stem mostly from differences in taxation levels across different energy products which in turn have different emissions coverage. In 2022, Uruguay framed its fuel tax as an explicit carbon tax in the transport sector, which has not yet been reflected in the data shown in this section.

Effective carbon rates

The OECD also estimates Net ECR that account for government measures that decrease pre-tax prices through direct budgetary transfers (i.e. fossil fuel subsidies) (Figure 34) (OECD, 2022[56]). This helps refine estimates of market incentives for decarbonisation. Net ECR estimates are available for 14 LAC countries.

In most LAC countries, average net ECR are relatively low compared to OECD countries and well below the EUR 30 per tonne of CO_2 benchmark,[14],albeit higher than explicit carbon taxes. In 2021, Costa Rica had the highest net ECR at EUR 47 per tCO_2e, followed by Jamaica at EUR 32.4 and Mexico at EUR 19.9 (Figure 34). Variations across sectors are significant. The highest net ECR is applied to the road transport sector, reaching, for example, EUR 121.8 per tCO_2e in Uruguay and EUR 116 in Costa Rica. Off-road transport (i.e. pipelines, rail transport, aviation and maritime transport) and agriculture are the next most priced sectors, up to EUR 81.6 per tCO_2e and EUR 83.4 in Costa Rica, respectively.

The share of emissions covered by carbon pricing is also relevant to assess the potential impact of these instruments. For example, 79.6% of GHG emissions in Jamaica are subject to a positive net ECR, the highest in the region, followed by 56% of emissions covered in Chile, 46% in Costa Rica and 42% in Mexico. In Argentina, Brazil, Colombia, Uruguay and Paraguay, less than 20% of emissions are priced (Figure 35)

These national averages mask sectoral differences. All road transport emissions are subject to a positive net ECR in most LAC countries. Seven LAC countries price all emissions from off-road transport and agriculture and four countries price more than 98% of emissions from electricity generation. The country with the largest fossil fuel subsidies is Ecuador, where subsidies provided to the building, transport (road and off-road), agriculture, fisheries and electricity sectors, resulted in a negative carbon price of EUR -17 per tCO_2e.

Governments can increase carbon prices through the introduction of new carbon taxes, increases in carbon tax rates, the phasing out of carbon tax reductions or exemptions, or by increasing the stringency of minimum standards for carbon price benchmarks.

Revenue potential from carbon taxation and reform of support to fossil fuels

The revenue foregone from adopting carbon taxation can be estimated as the difference between actual revenue (calculated from prices paid applied to their emissions base) and the potential revenue raised if all emissions were priced at three benchmarks rates (EUR 30, EUR 60, EUR 120) consistent with different decarbonisation scenarios and climate goals (Marten and van Dender, 2019[57])

The revenue potential from increasing effective carbon prices to the EUR 120 carbon benchmark differs substantially across countries. Higher pre-existing carbon prices (or lower fossil fuel subsidies) reduce the remaining revenue potential from pricing carbon to a given benchmark. As a result, some countries would raise revenue of less than 0.3% of GDP (e.g. Costa Rica), while others could raise revenue above 3% of GDP (e.g. Argentina, Ecuador and Jamaica) (Figure 37). Source***:*** OECD (2022), Pricing Greenhouse Gas Emissions: Turning Climate Targets into Climate Action, OECD Series on Carbon Pricing and Energy Taxation, OECD Publishing, Paris, https://doi.org/10.1787/e9778969-en.

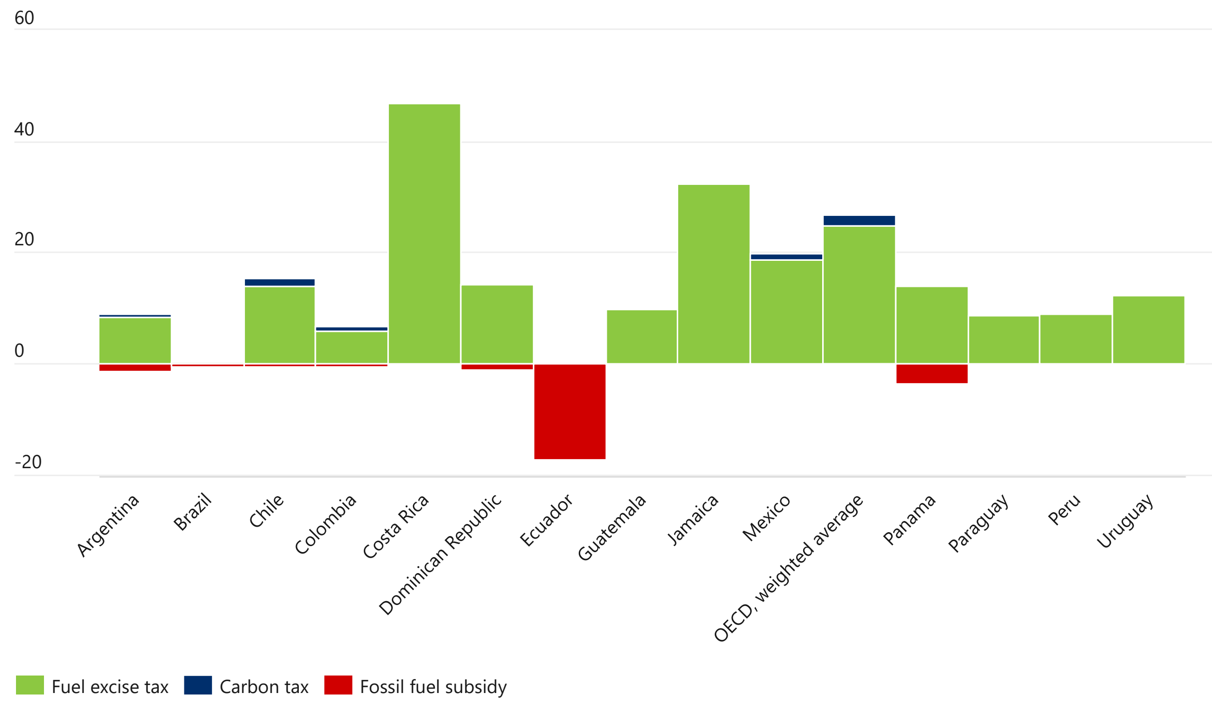
Figure 37. indicates the incremental revenue potential of more modest reform options, starting from reforming fossil fuel subsidies (removing negative carbon prices), followed by raising prices to a carbon benchmark of EUR 60. Higher revenue from carbon pricing could be used to provide targeted support to improve energy access and affordability, enhance social safety nets, and support other economic and social priorities.

Reforming government support to fossil fuels is an important lever for decarbonising the economy and mitigating greenhouse gas emissions. In addition to freeing substantial fiscal resources, these reforms could improve price signals to accelerate the development of lower carbon alternatives. The range of government interventions that can ultimately encourage the production or consumption of fossil fuels is very broad. As documented in the OECD Inventory of support measures for fossil fuels, Argentina, Chile, Colombia, and Mexico have all seen an increase in the amount of fossil fuel subsidies since 2016.

In Argentina, Chile and Colombia, most of support is waived in the form of direct transfers, whereas in Brazil, Costa Rica and Mexico, support is provided through the tax code in the form of tax expenditures. Most other LAC countries support fossil fuels through induced transfers (i.e. market regulation and price support for lower end-user price relative to the full cost of supply). The largest amount of government support is directed towards the production and consumption of petroleum (OECD, 2023[58]). LAC countries have reduced (by 32%) government support to fossil fuels between 2012 and 2019, however, they more than doubled in 2021 compared to 2020 as energy prices rose with the rebound of the global economy. They are expected to have further increased as global consumption subsidies were anticipated to skyrocket in 2022, due to higher fuel prices and energy use (IEA, 2023[59]).

Figure 34. Net Effective Carbon Rates

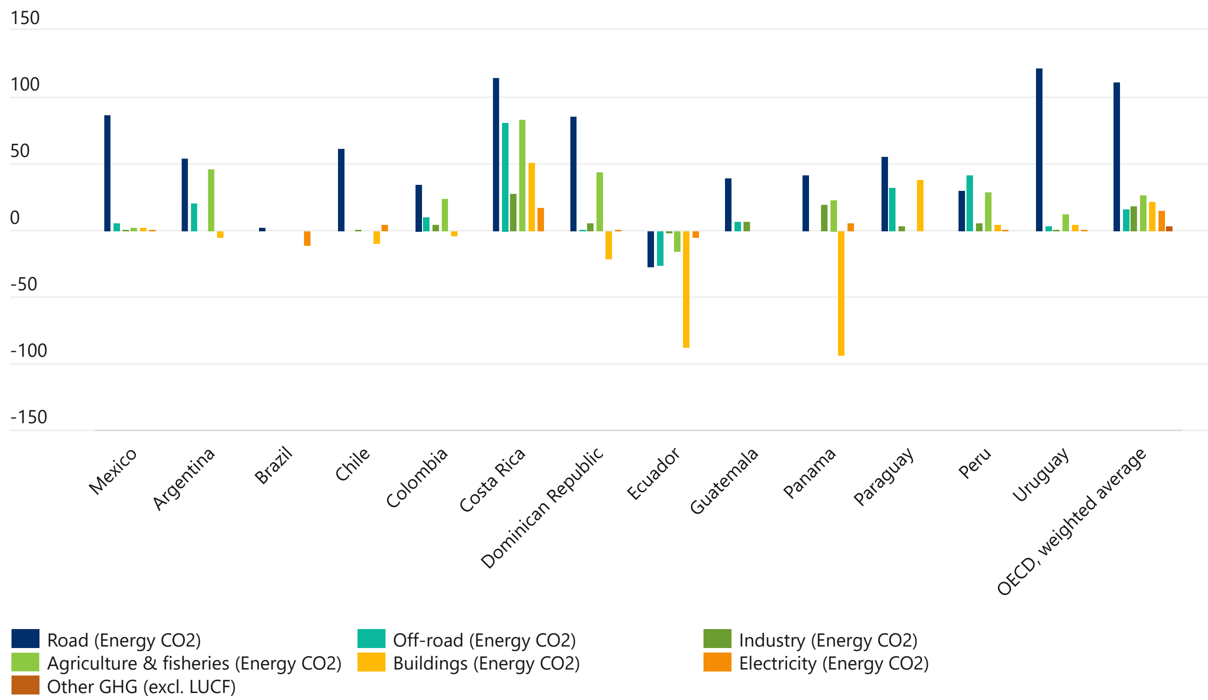
EUR per tCO2e, 2021



Compare: Link to the dashboard.
Note: The Effective Carbon Rate (ECR) estimates the price on carbon emissions arising from emissions trading systems, carbon taxes and fuel excise taxes. The Net ECR in addition account for fossil fuel subsidies that decrease pre-tax fossil fuel prices. Tax rates and permit prices refer to the same base year. Due to data limitations, 2021 fossil fuel subsidy estimates are based on data for 2020.
Source: OECD, “Net Effective Carbon Rates”, OECD Environment Statistics (database),https://stats.oecd.org/Index.aspx?DataSetCode=ECRS.

Figure 35. Net Effective Carbon Rates by sector

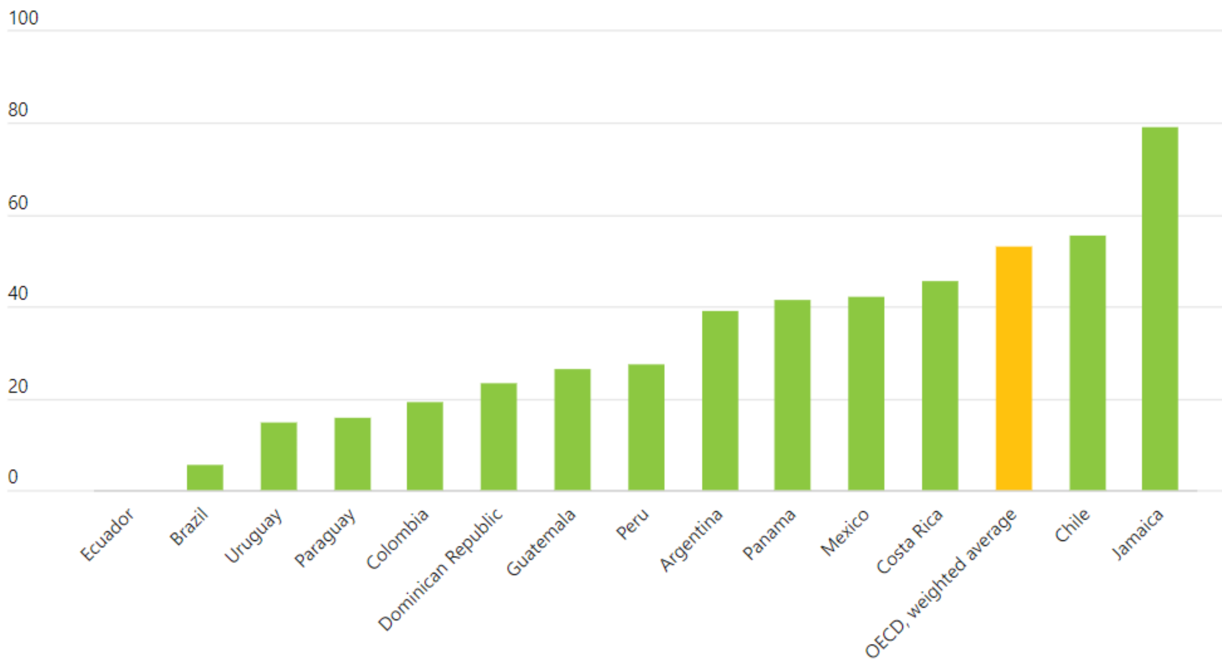
EUR per tCO_2e, 2021



Note: The Effective Carbon Rate (ECR) estimates the price on carbon emissions arising from emissions trading systems, carbon taxes and fuel excise taxes. The Net ECR in addition account for fossil fuel subsidies that decrease pre-tax fossil fuel prices. Tax rates and permit prices refer to the same base year. Due to data limitations, 2021 fossil fuel subsidy estimates are based on data for 2020. All sectors except "Other" refer to CO_2 emissions from energy use.
Source: OECD, "Net Effective Carbon Rates", OECD Environment Statistics (database),https://stats.oecd.org/Index.aspx?DataSetCode=ECRS.

Figure 36. Share of GHG emissions subject to a positive effective carbon rate

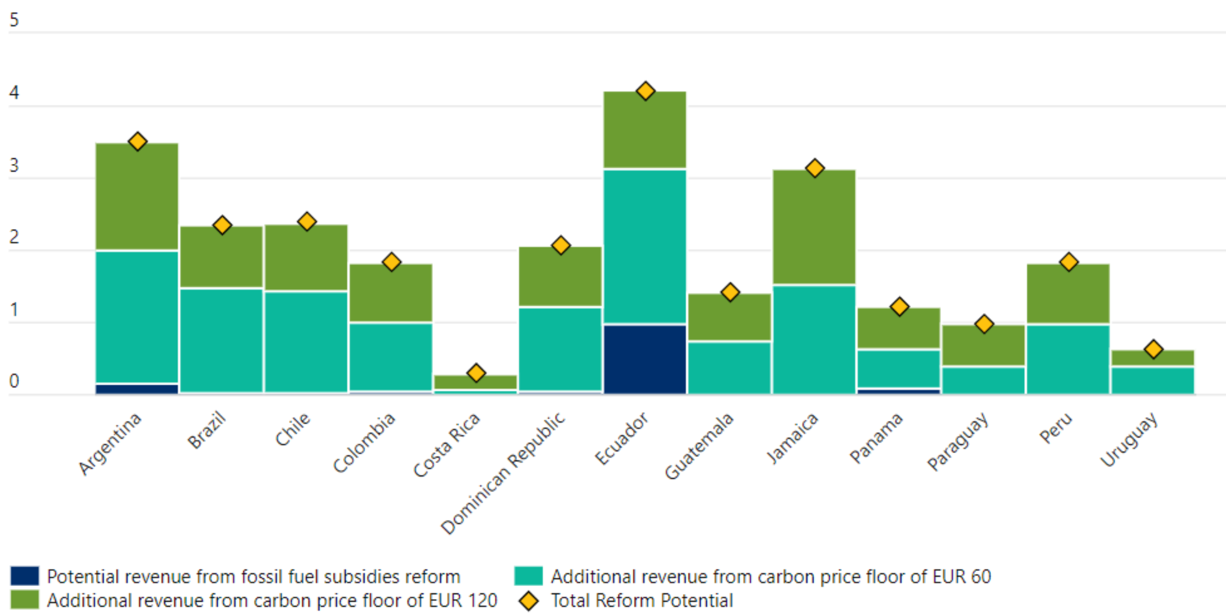
Percentage, 2021



Note: The Effective Carbon Rate (ECR) estimates the price on carbon emissions arising from emissions trading systems, carbon taxes and fuel excise taxes. The Net ECR in addition account for fossil fuel subsidies that decrease pre-tax fossil fuel prices. Tax rates and permit prices refer to the same base year. Due to data limitations, 2021 fossil fuel subsidy estimates are based on data for 2020. The carbon benchmark of EUR 60 tCO2e is a low-end estimate of the climate damage caused by each tonne of CO2 emitted in 2030 and the carbon prices that would be needed by then for consistency with net-zero emissions targets. It is also a mid-range benchmark of current carbon costs.
Source: OECD (2022), Pricing Greenhouse Gas Emissions: Turning Climate Targets into Climate Action, OECD Series on Carbon Pricing and Energy Taxation, OECD Publishing, Paris, https://doi.org/10.1787/e9778969-en.

Figure 37. Revenue potential from fossil fuel subsidy and carbon price reform

Revenue as % of GDP



Note: Revenue estimates may be considered an upper bound of the actual revenue potential as they were estimated on historical data (fewer and more expensive low-carbon technologies, lower carbon prices, few developing countries in the sample). Estimates are for fossil fuel CO_2 emissions and do not include the revenue potential from reforming the pricing of other GHG or biofuels. Current net revenues are a bottom-up estimate using the Net ECR dataset and may not correspond to the revenues collected in practice. The carbon benchmark of EUR 60/t is a low-end estimate of the climate damage caused by each tonne of CO_2 emitted in 2030 and the carbon prices that would be needed by then for consistency with net-zero emissions targets. It is also a mid-range benchmark of current carbon costs. EUR 120/t represents a central estimate of the carbon price needed in 2030 to decarbonise by mid-century under the assumption that carbon pricing plays a major role in the overall decarbonisation effort.

Source: OECD (2022), Pricing Greenhouse Gas Emissions: Turning Climate Targets into Climate Action, OECD Series on Carbon Pricing and Energy Taxation, OECD Publishing, Paris, https://doi.org/10.1787/e9778969-en.

Comparability, interpretation and data availability

The OECD has estimated effective carbon rates (ECR) net of pre-tax support measures for fossil fuels. ECR estimate the price on carbon emissions arising from fuel excise taxes, carbon taxes, and tradeable carbon emission permits; they do not account for government measures that decrease pre-tax prices of fossil fuels. Direct budgetary transfers are one example of such measures. They are often provided to users to alleviate fuels costs and take the form of reimbursements to final consumers or to energy suppliers to compensate a (below-market) regulated price that ultimately benefits final consumers. By effectively reducing pre-tax fossil fuel prices, they act as a negative carbon price. This support type has been integrated to the ECR framework to construct effective carbon rates net of pre-tax direct transfers – i.e. Net ECR indicators. Only 14 LAC countries are analysed in the Net ECR database. However, it does provide a guide to progress in the region and suggests a way forward for dealing with data gaps.

Official Development Assistance

Recent developments

In 1992, at the Earth summit in Rio de Janeiro, three environmental conventions were established: the UNFCCC, the CBD and the United Nations Convention to Combat Desertification. Country parties committed to assist developing countries in the implementation of the Rio Conventions.

The OECD Development Assistance Committee (DAC) is an international forum gathering 31 of the largest aid providers, with the mandate to contribute to the implementation of the 2030 Agenda for Sustainable Development. The OECD-DAC Statistical system monitors the streamlining of the objectives of the Rio conventions and of environmental objectives in development co-operation activities through a set of Rio markers on biodiversity, climate change adaptation, and climate change mitigation. LAC countries receive aid from DAC donors, whereby climate change mitigation is prioritised with the largest sums, followed by biodiversity and climate change adaptation. A scoring system of three values is used, in which development co-operation activities are "marked" as targeting the environment or the Rio Conventions as the "principal" objective or a "significant" objective, or as not targeting the objective. Considering both aid that principally and significantly target these environmental aims, Colombia stands out as a principal recipient of DAC aid, followed by Mexico, Brazil, Costa Rica, Peru, the Dominican Republic, Cuba and Ecuador.

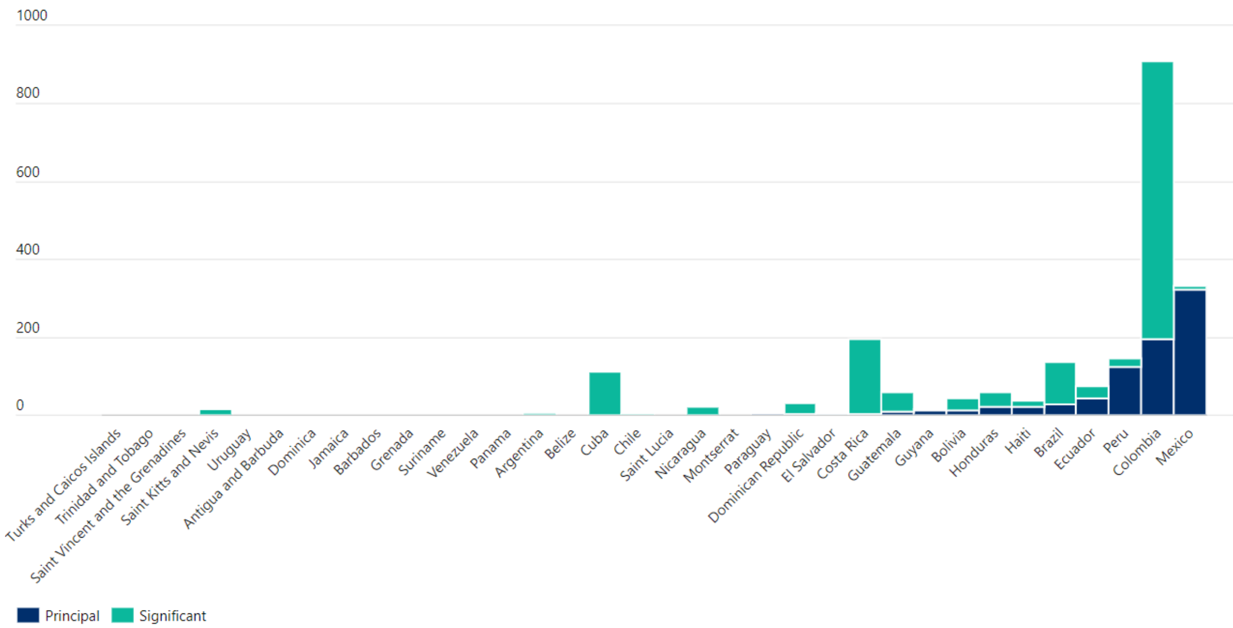
At the 15th Conference of Parties of the UNFCCC in Copenhagen in 2009, developed countries committed to a collective goal of mobilising USD 100 billion per year by 2020 for climate action in developing countries, in the context of meaningful mitigation actions and transparency on implementation. USD 83.3 billion was provided and mobilised by developed countries for climate action in developing countries in 2020. While increasing by 4% from 2019, this was USD 16.7 billion short of the USD 100 billion per year by 2020 goal (OECD, 2022[60]).

Between 2016 and 2020, mitigation finance accounted for 73% of total climate finance provided and mobilised in Americas, while adaptation finance represented 18%. Public finance was mainly provided in the form of loans (81% of total public finance for climate) while 17% war provided as grants. Grants typically support capacity building, feasibility studies, demonstration projects, technical assistance, and activities with low or no direct financial returns but high social returns. Public climate finance loans are often used to fund mature or close-to mature technologies as well as large infrastructure projects with a future revenue stream, which are predominant for mitigation finance as well as in middle-income countries (OECD, 2022[60]).

About 26% of private climate finance was mobilised for the Americas. Almost two-thirds (64%) of private climate finance mobilised for Small Island Developing States was allocated to the countries and territories in the Caribbean region (OECD, 2022[60]). The ability of donor countries to mobilise private finance for climate action in developing countries is influenced by the composition of bilateral and multilateral providers' portfolios (mitigation-adaptation, instruments and mechanisms, geography, and sectors), policy and broader enabling environments in developing countries, as well as general macroeconomic conditions. Adaptation continued to represent a small share of total private climate finance mobilised. In contrast to many mitigation projects, notably in the energy sector, adaptation projects often lack the revenue streams needed to secure large-scale private financing. It is also challenging to mobilise private finance for activities that increase the resilience of smaller actors, e.g. small enterprises, and farmers.

Figure 38. Aid activities targeting biodiversity

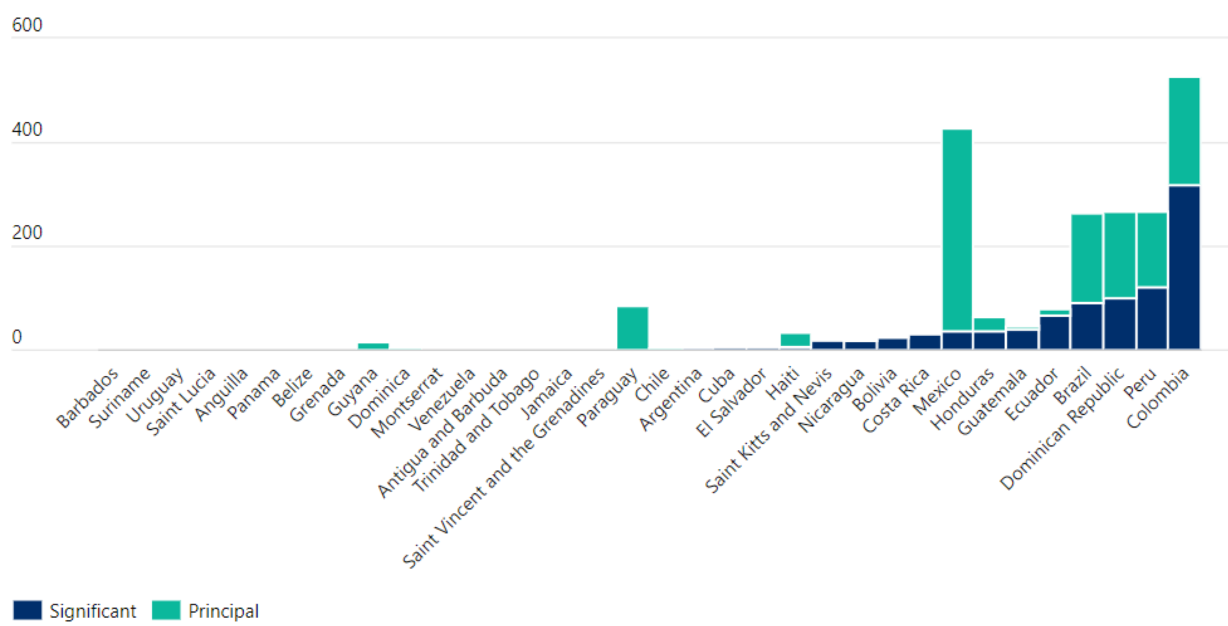
Aid received from DAC members, million USD, 2021



Compare: [Link to the dashboard.]
Source: OECD, "Aid activities targeting Global Environmental Objectives (CRS)", OECD Development Statistics (database), http://stats.oecd.org/Index.aspx?DataSetCode=RIOMARKERS.

Figure 39. Aid activities targeting climate change mitigation

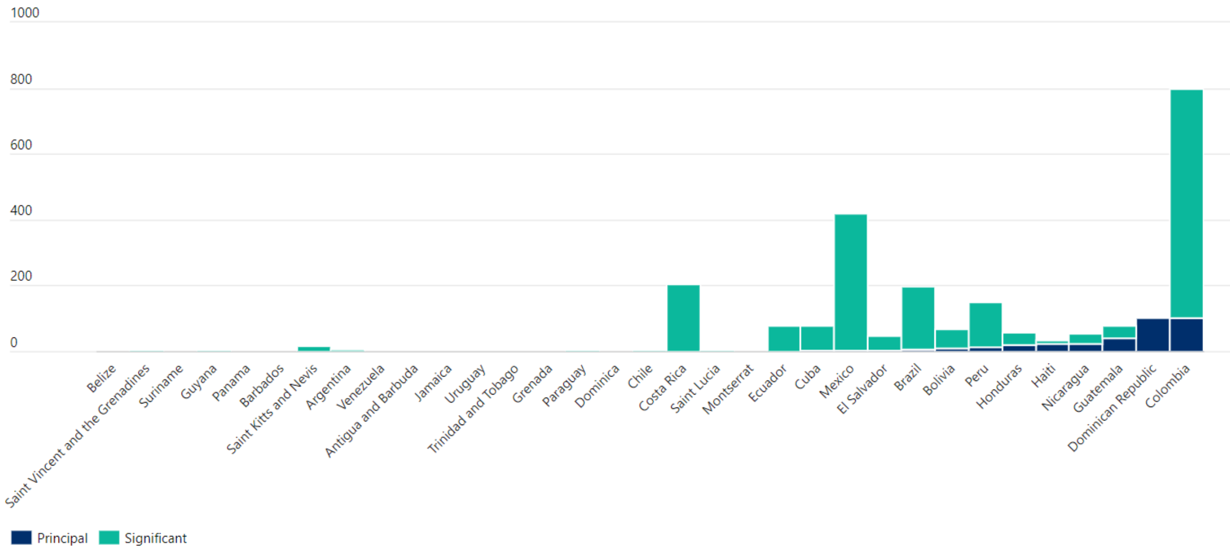
Aid received from DAC members, million USD, 2021



Compare: [Link to the dashboard.]
Source: OECD, "Aid activities targeting Global Environmental Objectives (CRS)", OECD Development Statistics (database), http://stats.oecd.org/Index.aspx?DataSetCode=RIOMARKERS.

Figure 40. Aid activities targeting climate change adaptation

Aid received from DAC members, million USD, 2021



Compare: [Link to the dashboard.]()
Source: OECD, "Aid activities targeting Global Environmental Objectives (CRS)", OECD Development Statistics (database), http://stats.oecd.org/Index.aspx?DataSetCode=RIOMARKERS.

Comparability, interpretation and data availability

A large majority of activities targeting the objectives of the Rio Conventions fall under the DAC definition of "aid to environment". The Rio markers permit their specific identification. The same activity can be marked for several objectives, e.g. climate change mitigation and biodiversity. These overlaps reflect that the three Rio Conventions are interlinked and mutually reinforcing. However, care needs to be taken not to double-count the amounts when compiling the total for aid in support of more than one Convention: biodiversity-, climate change- and desertification-related aid should not be added up as this can result in double or triple-counting.

Glossary

Socio-economic and geographic context

Gross Domestic Product per capita: Gross Domestic Product per capita (USD/person) is expressed at constant 2015 USD PPP prices. GDP per capita measures a country's economic wealth of the population of a nation. However, as a mean value it does not reflect income distribution. Moreover, it is a gross measure of income, and no account is taken of the depreciation neither of produced assets nor of the depletion of natural assets. The main sources for GDP data are the Gross domestic product dataset of Aggregate National Accounts of the OECD National Accounts Statistics Database and the most recent OECD Economic Outlook. OECD data are complemented with data from the World Development Indicators of the World Bank, reference series of the International Energy Agency, and data from the International Monetary Fund.

Land use: The data presented here give information concerning land use state and changes (e.g. agricultural land, forest land). The definitions used in different countries may show variations.

- **Land area** excludes area under inland water bodies (i.e. major rivers and lakes).
- **Arable** refers to all land generally under rotation, whether for temporary crops (double-cropped areas are counted only once) or meadows, or left fallow (less than five years). These data are not meant to indicate the amount of land that is potentially cultivable.
- **Permanent crops** are those that occupy land for a long period and do not have to be planted for several years after each harvest (e.g. cocoa, coffee, rubber). Land under vines and trees and shrubs producing fruits, nuts and flowers, such as roses and jasmine, is so classified, as are nurseries (except those for forest trees, which should be classified under "forests and other wooded land").
- **Arable and permanent crop land** is defined as the sum of arable area and land under permanent crops.
- **Permanent meadows and pastures** refer to land used for five years or more to grow herbaceous forage crops, either cultivated or growing wild (wild prairie or grazing land).
- **Forest** refers to land spanning more than 0.5 hectare (0.005 km2) and a canopy cover of more than 10 percent, or trees able to reach these thresholds in situ. This includes land from which forests have been cleared but that will be reforested in the foreseeable future. This excludes woodland or forest predominantly under agricultural or urban land use and used only for recreation purposes.
- **Other areas** include built-up and related land, wet open land, and dry open land, with or without vegetation cover. Areas under inland water bodies (rivers and lakes) are excluded.

Population: Population is the de facto population in a country, area or region as of 1 July of the year indicated. The main source of population data is the World Population Prospects database from the United Nations, complemented with data from the World Development Indicators of the World Bank.

Population density: The number of inhabitants per square kilometre of total country area (persons/km2). Population is defined here as all nationals present in or temporarily absent from a country, and foreign nationals permanently settled in the country. Population is the de facto population in a country, area or region as of 1 July of the year indicated. The main source of population data is the Population Statistics database from the Organisation for Economic Co-operation and Development, complemented with the World Population Prospects database from the United Nations, then with data from the World Development Indicators of the World Bank as a third source, and with data from the World Economic Outlook from the International Monetary Fund as a fourth source. Total area data are obtained from the Land Resources dataset of the OECD Environment Database.

Climate change mitigation

Greenhouse gas (GHG) emissions: GHG emissions refer to the sum of GHGs that have direct effects on climate change and are considered responsible for a major part of global warming: carbon dioxide (CO_2), methane (CH_4), nitrous oxide (N_2O), chlorofluorocarbons (CFCs), hydrofluorocarbons (HFCs), perfluorocarbons (PFCs), sulphur hexafluoride (SF_6) and nitrogen trifluoride (NF_3). They refer to GHGs emitted within the national territory and may include or exclude emissions and removals from land use change and forestry (LUCF). They do not cover international transactions of emission reduction units or certified emission reductions. Greenhouse gas emission estimates are divided into main sectors, which are groupings of related processes, sources and sinks.

Mean population exposure to fine particulates ($PM_{2.5}$): Expressed as the mass of $PM_{2.5}$ per cubic meter. Calculated as the mean annual outdoor $PM_{2.5}$ concentration weighted by population living in the relevant area, that is, the concentration level, expressed in $\mu g/m^3$, to which a typical resident is exposed throughout a year.

The guideline set by the WHO for $PM_{2.5}$ is that annual mean concentrations should not exceed 10 micrograms per cubic meter, representing the lower range over which adverse health effects have been observed. The WHO has also recommended guideline values for emissions of $PM_{2.5}$ from burning fuels in households.

Exposure to ambient particulate matter is estimated by combining satellite data with a chemical transport model, land use information, and calibrated using ground measurements. An integrated exposure-response curve is used to calculate a relative risk for exposure to particulate matter from both ambient and residential (household) sources, and these are then weighted by the proportion of individuals exposed to each source. The method is described in detail in the technical appendix 1 of GBD 2019 Risk Factor Collaborators (2020).

Mortality attributed to exposure to fine particulates: Premature deaths are calculated as the number of premature deaths attributed to exposure to environment-related risks, expressed in absolute value, per million inhabitants of the same age group and sex (mortality).

Production-based CO_2 intensity: Production-based CO_2 intensity is calculated as CO_2 emissions per capita (tonnes/person). Included are CO_2 emissions from combustion of coal, oil, natural gas and other fuels. The estimates of CO_2 emissions are obtained from the IEA's database of CO_2 emissions from fuel combustion. Default methods and emission factors are given in the Revised 1996 IPCC Guidelines for National Greenhouse Gas Inventories.

Production-based CO_2 productivity: Production-based CO_2 productivity is calculated as real GDP generated per unit of CO_2 emitted (USD/kg). Included are CO_2 emissions from combustion of coal, oil, natural gas and other fuels. The estimates of CO_2 emissions are obtained from the IEA's database of CO_2 emissions from fuel combustion. Default methods and emission factors are given in the Revised 1996

IPCC Guidelines for National Greenhouse Gas Inventories. GDP is expressed at constant 2015 USD using PPP.

Share of renewables in electricity production and total energy supply: Total energy supply includes electricity trade. Renewables include hydro, geothermal, solar (thermal and PV), wind and tide/wave/ocean energy, as well as combustible renewables (solid biomass, liquid biomass, biogas) and waste (renewable municipal waste). The underlying data on “renewables and waste energy supply (ktoe)” are obtained from the World – Renewable and Waste Energy Statistics dataset of the IEA Renewables Information Statistics Database. Data on Total Energy Supply are obtained from the IEA database on World Energy Statistics and Balances.

Total energy supply: TES is made up of production + imports - exports - international marine bunkers - international aviation bunkers ± stock changes. Primary energy comprises coal, peat and peat products, oil shale, natural gas, crude oil and oil products, nuclear, and renewable energy (bioenergy, geothermal, hydropower, ocean, solar and wind). Electricity trade is included in total primary energy supply but excluded from the calculation of the breakdown by source.

Welfare cost of mortality from exposure to fine particulates: Welfare costs of premature deaths from exposure to environment-related risks are expressed in millions constant 2015 USD using PPP, compared to GDP as percentage points of GDP equivalent, per capita (total population across age groups and sex), and as a percentage of the welfare cost of total attributable premature deaths. Cost estimates represent only the cost of premature mortalities. They are calculated using estimates of the “Value of a Statistical Life” (VSL) and the number of premature deaths attributable to each environmental risk. They exclude any morbidity impacts (labour productivity losses, treatment costs and willingness to pay to avoid pain and suffering from illness). They also exclude impacts other than those on human health (e.g. on built structures, agricultural productivity, ecosystem health). The social cost of the exposure to these environment-related risks is thus greater than the cost of mortalities presented in this chapter. Yet the available evidence suggests that mortality costs account for the bulk of the total costs to society. Finally, VSL also captures non-market values that are unrelated to expenditures and therefore not an integral part of the calculation of GDP. Consequently, the cost estimates are compared with GDP only for illustration.

Climate change adaptation

Annual surface temperature change: Annual surface temperature change is measured in Celsius degrees (°C). It is calculated as the difference between the annual average temperature (in a given year) and the average annual temperature of the 1951-1980 period. Data are obtained from the FAOSTAT Temperature Change dataset of the Food and Agriculture Organization of the United Nations. Data are based on the publicly available GISTEMP data, the Global Surface Temperature Change data distributed by the NASA Goddard Institute for Space Studies (NASA-GISS).

Climate-related extreme weather events: Extreme weather events are defined as a weather event resulting in 10 or more casualties, 100 or more affected people, the declaration of a state of emergency, or a call for international assistance. Climate-related weather events include meteorological (extreme temperature, fog, storm), hydrological (wave action, landslide, flood), and climatological (wildfire, glacial lake outburst, drought). EM-DAT data covers both independent countries and dependent territories.

Cropland exposure to extreme precipitation events: extreme precipitation refers to a daily precipitation that exceeds the 99th percentile value over the reference period 1981-2010. Unlike a monthly approach, used for example for extreme temperature, percentiles are computed using all wet days of the reference period (i.e. 1981-2010) because the data sample would otherwise be too small to robustly compute seasonally adjusted percentiles. It defines a wet day as a day where total precipitation is above or equal to 1 mm. Since percentiles are computed using all wet days of the reference period in a given location, this implies a different occurrence frequency between different locations.

Forested area exposure to fire danger: Fire danger is estimated with the Canadian Fire Weather Index (FWI), adjusted to account for biomass availability. Fire danger is defined as FWI values of 5 or higher (indicating very high or extreme fire danger).

Land exposure to cyclones: Category 1 cyclones on the Saffir-Simpson scale are described as "very dangerous winds that will produce some damage". Higher categories cover extensive, devastating and catastrophic damage respectively. The return period is the average or estimated time that a specific climate-related hazard is likely to recur.

Mortality attributed to high temperature: Exposure to high and low temperature is estimated by combining ERA5 climate reanalysis data with gridded population data. An integrated exposure-response meta-analysis model is used to calculate a relative mortality risk for exposure to average daily temperatures and temperature zones. The GBD study performs a systematic assessment of risk across the whole temperature range (i.e. including moderate non-optimal temperatures) in populations exposed to different climates. The method is described in detail in the technical appendix 1 of GBD 2019 Risk Factor Collaborators (2020).

Population and built-up area exposure to river flooding: River floods exposure indicators were computed using JRC River Flood Hazard Maps for Europe and the Mediterranean Basin region, and for the World (Dottori, 2021[61]). The maps depict flood prone areas for river flood events for six different flood frequencies (from 1-in-10-years to 1-in-500-years). Cell values on these maps indicate the water depth (in m). For countries located in Europe and around the Mediterranean Basin, the regional flood hazard maps were used, as the spatial resolution is higher (100 m) than the global maps (1 km). For the remaining countries, the global maps were used. To get flood prone areas, a threshold of 1 cm was applied on the water depth. The return period is the average or estimated time that a specific climate-related hazard is likely to recur.

Population exposure to hot summer days: Hot summer days are defined as those during which daily maximum temperature surpasses 35 °C. Due to the resolution of the raw data, it is possible that heat stress for small islands is slightly underestimated. There are also several additional indicators to describe heat stress (such as the UTCI (Universal Thermal Climate Index), which also takes moisture, wind and solar radiation into account); these should be taken into account for a more thorough analysis of exposure to heat for single countries.

Population exposure to tropical nights: Tropical nights are defined as nights where the minimum temperature does not fall below 20 °C. Due to the resolution of the raw data, it is possible that heat stress for small islands is slightly underestimated. There are also several additional indicators to describe heat stress (such as the UTCI), which also takes moisture, wind and solar radiation into account); these should be taken into account for a more thorough analysis of exposure to heat for single countries.

Soil moisture anomaly in cropland: Soil moisture anomaly is a suitable indicator for monitoring the intensity of droughts and shows similar performances in identifying droughts to the Standardized Precipitation Index. Copernicus CDS ERA5-Land monthly averaged data and Copernicus global land cover data is used to calculate average cropland soil moisture anomaly.

Hazard	Exposure threshold
Extreme heat	More than 14 hot summer days (daily maximum temperature > 35 °C) or tropical nights (daily minimum temperature > 20 °C) per year.
Wildfire	Very high or extreme fire danger based on the Canadian Fire Weather Index (FWI), adjusted for biomass availability.
Wind threats	Occurrence of violent storms (Beaufort class 11) or a 10% probability or higher of a tropical cyclone to recur in a 10-year period (Hurricane category 1 or higher on the Saffir Simpson scale)
River flooding	Inundation zone of a river flood event to recur with a 10% probability in a 10-year period
Coastal flooding	Inundation zone of a coastal flood to recur with a 10% probability in a 10-year period

Terrestrial and marine protected areas as percentage of total land and of exclusive economic zone (EEZ): Protected areas are areas of land and/or sea especially dedicated to the protection and maintenance of biological diversity and of natural and associated cultural resources, and managed through legal or other effective means. The data refer to the World Conservation Union (IUCN) management categories I-VI. National classifications may differ. The data cover areas under the management categories:

- I (strict nature reserves and wilderness areas),
- II (national parks),
- III (natural monument or feature)
- IV (habitat or species management area),
- V (protected landscape or seascape) and
- VI (protected area with sustainable use of natural resources).

Areas nationally/internationally designated without any IUCN category assigned are also included. This category includes regional and international designations such as the European Natura 2000 network.

In general, under the 1982 UN Convention on the Law of the Sea the EEZ of a country extends 200 nautical miles from the coastline, or to the mid-point between coastlines where the EEZ of different countries would otherwise overlap.

Climate policy instruments

Aid activities targeting Global Environmental Objectives (CRS): In their reporting to the DAC CRS, donors are requested to indicate for each activity whether it targets environment and the Rio Conventions (biodiversity, climate change mitigation, climate change adaptation and desertification). A scoring system of three values is used, in which aid activities are "marked" as targeting environment as the "principal objective" or a "significant objective", or as not targeting the objective.

The environment marker identifies activities that are intended to produce an improvement in the physical and/or biological environment of the recipient country, area or target group concerned or include specific action to integrate environmental concerns with a range of development objectives through institution building and/or capacity development.

Climate actions and policies: A policy is counted as adopted when it is effective in national legislation. Policies include sectoral policies (both market and non-market-based instruments applied across the electricity, transport, buildings, and industry sectors), cross-sectoral policies (such as GHG emission targets, public RD&D expenditure, fossil fuel production policies and climate governance), and international policies (such as international co-operation, public finance, and emissions reporting). Policies included directly contribute to all broader mitigation strategies that are mentioned in the UNFCCC synthesis report on the first Global Stocktake. Both climate policies with an explicit intent of advancing mitigation (e.g. carbon taxes, GHG emissions standards, subsidies for zero-carbon technologies) as well as non-climate policies that have an expected positive effect on mitigation are included (e.g. fuel excise taxes, energy efficiency standards, congestion charges). More information on the policies included can be found in (Nachtigall et al., 2022[62]).

Environmentally related taxes: compulsory, unrequited payment to government levied on tax bases deemed to be of environmental relevance, i.e. taxes that have a tax base with a proven, specific negative impact on the environment. Taxes are unrequited in the sense that benefits provided by government to taxpayers are normally not in proportion to their payments. This means that there needs to be a redistributive element in order for a payment to be considered a tax. Environmentally related taxes increase the cost of a carbon product or activity, which tends to discourage its production or consumption, regardless of what was the intention behind the introduction of the tax. In this database, the term ''levy'' is used to cover taxes, fees and charges. The tax bases covered include:

- Energy products
- Transport equipment and transport services
- Pollution, including measured or estimated emissions to air and water, ozone-depleting substances, certain non-point sources of water pollution, waste management and noise
- Natural resources, such as management of water, land, soil, forests, biodiversity, wildlife and fish stocks, including mining and quarrying.

The tax base of environmentally related taxes may thus include both (i) the first-best taxes on the negative by-products (e.g. emissions) and (ii) the second-best taxes on inputs or (intermediate) outputs of a polluting activity (e.g. fuel purchases, ownership or use of a motor vehicle). As such, taxes on NOX emissions fall in the former category, while excise taxes on petrol, diesel, LPG or CNG for vehicles or taxes on mining activities (extraction and exploration rights) would fall in the latter category. In all these cases, the unrequited character holds when there is no proportionality between the environmental benefits of the taxpayers and their payments. However, borderline cases may occur, and these cases are discussed below. Taxes on resource rents (or any other taxes on profits) are not included in the definition of environmentally related taxes, because they do not affect relative prices, while revenues from auctioning of emission permits are included and labelled as ''taxes''.

Net Effective Carbon Rates: The Effective Carbon Rate (ECR) is the sum of fuel excise taxes, carbon taxes and tradeable permits that effectively put a price on carbon emissions. The Net ECR equals the ECR minus fossil fuel subsidies that decrease pre-tax fossil fuel prices. Electricity excise taxes and subsidies generally do not treat fossil fuels in a differential manner compared to clean sources and are therefore excluded from the Net ECR indicator. EUR 60 per tonne of CO_2e is a midpoint estimate for carbon costs in 2020, and a low-end estimate for 2030. Pricing all emissions at least at EUR 60 in 2020 shows that a country is on a good track to reach the goals of the Paris Agreement to decarbonize by mid-century economically. EUR 30 is a historic low-end estimate for carbon costs, and EUR 120 is a midrange estimate for carbon costs in 2030. The share of emissions priced above EUR Y per tCO_2-e shows the share of emissions within a country or sector with a carbon price that exceeds EUR Y in percent.

Tax rates and permit prices refer to the same base year. Due to data limitations, 2021 fossil fuel subsidy estimates are based on data for 2020. Effective tax rates for 2018 and 2021 are both mapped to 2018 energy use and emissions data, which facilitates comparisons between the two points in time, as changes in average rates are not affected by changes in the composition of energy use and GHG emissions. At the time of data collection, the latest available energy use, emissions, and ETS coverage data available for all countries was from 2018, which was used as a proxy for the 2021 base. Tax and subsidy data was collected via publicly available official sources and consultation with government officials and independent experts who were asked to review and refine the data.

The database focuses on pricing instruments that specifically apply to a base that is directly proportional to energy use or GHG emissions. It therefore excludes taxes and fees that are only partially correlated with energy use or GHG emissions. Common examples of policy instruments that fall outside the scope of the database include vehicle purchase taxes, registration or circulation taxes, and taxes that are directly levied on non-GHG emissions, such as the Danish tax on SOx. Some countries also apply production taxes on the extraction or exploitation of energy resources (e.g. severance taxes on oil extraction). Since these supply-side measures are not directly linked to domestic energy use or emissions, the database does not cover them either. Similarly, the database does not include value added taxes (VAT) or sales taxes. As VAT in principle applies equally to a wide range of goods, they do not change the relative prices of products and services (i.e. they do not make carbon-intensive goods and services more expensive than cleaner alternatives).

Data sources, references and further reading

Cárdenas, M. and S. Orozco (2022), *The challenges of climate mitigation in Latin America and the Caribbean: Some proposals for action*, UNDP, New York, https://www.undp.org/sites/g/files/zskgke326/files/2023-01/PNUDLAC-working-paper-40%20climate%20EN-final.pdf (accessed on 28 April 2023). [23]

CEPALSTAT (2023), *Latin America and the Caribbean: Regional Economic Profile*, https://statistics.cepal.org/portal/cepalstat/regional-profile.html?theme=2&lang=en. [7]

CEPALSTAT / WTO (2022), *Compendium of Tourism Statistics*. [12]

Climate Watch (2022), *Climate Watch Data*, https://www.climatewatchdata.org/ (accessed on 16 February 2023). [20]

Dottori, F. (2021), *River flood hazard maps for Europe and the Mediterranean Basin region. European Commission*, European Commission, Joint Research Centre (JRC). [61]

ECLAC (2022), *Demographic Observatory Latin America and the Caribbean 2022*, https://repositorio.cepal.org/bitstream/handle/11362/48490/S2200705_en.pdf?sequence=1&isAllowed=y. [2]

ECLAC (2021), *The Outlook for Agriculture and Rural Development in the Americas: A Perspective on Latin America and the Caribbean 2021-2022*, https://hdl.handle.net/11362/47209 (accessed on 16 February 2023). [15]

ECLAC (2015), *The economics of climate change in Latin America and the Caribbean*, https://repositorio.cepal.org/bitstream/handle/11362/37311/S1420655_en.pdf (accessed on 16 February 2023). [53]

ECLAC (2010), *The Economics of Climate Change in Central America: Summary 2010*, http://The Economics of Climate Change in Central America: Summary 2010 (accessed on 16 February 2023). [45]

Economic Commission for Latin America and the Caribbean (ed.) (2019), *Contribuciones a un gran impulso ambiental para América Latina y el Caribe: movilidad urbana sostenible*, https://repositorio.cepal.org/bitstream/handle/11362/44668/1/S1801160_es.pdf. [73]

EM-DAT (2023), *EM-DAT Public, Emergency Events Database*, https://www.emdat.be/database (accessed on 20 February 2023). [44]

EUROCLIMA (2022), *Nature-based solutions in the NDCs of Latin American and Caribbean countries: classification of commitments for climate action*, https://www.euroclima.org/seccion-publicaciones/tipo-de-documentos/doc-tecnicos-publicaciones/ultimas-publicaciones/full-report-nature-based-solutions-in-the-ndcs-of-latin-american-and-caribbean-countries-classification-of-commitments-for-climate-action?f. [16]

FAO (2023), *FAOSTAT*, https://www.fao.org/faostat/en/#home (accessed on 16 February 2023). [1]

German Watch (2021), *Global Climate Risk Index 2021*, https://www.germanwatch.org/en/19777#:~:text=The%20Global%20Climate%20Risk%20Index,direct%20economic%20losses%20were%20analysed (accessed on 16 February 2023). [42]

Gouveia, N. et al. (2021), "Ambient fine particulate matter in Latin American cities: Levels, population exposure, and associated urban factors", *Science of The Total Environment*, Vol. 772, p. 145035, https://doi.org/10.1016/j.scitotenv.2021.145035. [30]

Hartinger, S. et al. (2023), "The 2022 South America report of The Lancet Countdown on health and climate change: trust the science. Now that we know, we must act", *The Lancet Regional Health - Americas*, Vol. 20, p. 100470, https://doi.org/10.1016/j.lana.2023.100470. [46]

IEA (2023), *Extended World Energy Balances 2022*, http://dotstat.oecd.org/OECDStat_Metadata/ShowMetadata.ashx?Dataset=WBIG_2022&ShowOnWeb=true&Lang=en (accessed on 3 April 2023). [29]

IEA (2023), *Fossil Fuels Consumption Subsidies 2022*, IEA, Paris, https://www.iea.org/reports/fossil-fuels-consumption-subsidies-2022 (accessed on 28 April 2023). [59]

IEA (2022), *IEA CO2 Emissions from Fuel Combustion Statistics: Greenhouse Gas Emissions from Energy*, https://www.oecd-ilibrary.org/energy/data/iea-co2-emissions-from-fuel-combustion-statistics_co2-data-en. [22]

IEA (2022), *IEA Electricity Information 2022*, https://www.iea.org/data-and-statistics/data-product/electricity-information (accessed on 3 April 2023). [10]

IEA (2021), *Climate Impacts on Latin American Hydropower*, https://www.iea.org/reports/climate-impacts-on-latin-american-hydropower. [35]

IMF (2023), *World Economic Outlook - Update January 2023*, https://www.imf.org/en/Publications/WEO/Issues/2023/01/31/world-economic-outlook-update-january-2023. [4]

Institute for Health Metrics and Evaluation (2019), *Global Burden of Disease Study 2019*, https://vizhub.healthdata.org/gbd-results/ (accessed on 16 February 2023). [25]

IPBES (2018), *The IPBES regional assessment report on biodiversity and ecosystem services for the Americas*, https://doi.org/10.5281/zenodo.3236253 (accessed on 16 February 2023). [51]

IPBES and IPCC (2021), *Biodiversity and Climate Change: Scientific outcome*, https://www.ipbes.net/sites/default/files/2021-06/2021_IPCC-IPBES_scientific_outcome_20210612.pdf (accessed on 21 April 2023). [37]

IPCC (2023), *Synthesis Report of the IPCC Sixth Assessment Report (AR6)*, https://www.ipcc.ch/report/ar6/syr/ (accessed on 21 April 2023). [18]

IPCC (2022), *Climate Change 2022: Impacts, Adaptation and Vulnerability*, Intergovernmental Panel on Climate Change, https://report.ipcc.ch/ar6wg2/pdf/IPCC_AR6_WGII_FinalDraft_FullReport.pdf (accessed on 10 March 2022). [40]

IPCC (2021), *Special Report: Global Warming of 1.5 ºC*, https://www.ipcc.ch/sr15/chapter/glossary/ (accessed on 16 February 2023). [36]

Koren, I. et al. (2004), "Measurement of the Effect of Amazon Smoke on Inhibition of Cloud Formation", *Science*, Vol. 303/5662, pp. 1342-1345, https://doi.org/10.1126/science.1089424. [27]

Libertun de Duren, N. et al. (2022), *Inclusive Cities: Healthy Cities for All*, Inter-American Development Bank, Washington, D. C., https://doi.org/10.18235/0004459. [32]

Maes, M. et al. (2022), *Monitoring exposure to climate-related hazards: Indicator methodology and key results*, OECD Publishing, https://doi.org/10.1787/19970900. [39]

Marten, M. and K. van Dender (2019), "The use of revenues from carbon pricing", *OECD Taxation Working Papers*, No. 43, OECD Publishing, Paris, https://doi.org/10.1787/3cb265e4-en. [57]

Maxwell, A. (2019), *Latin America's Air Pollution Impacts Climate and Health*, NRDC, https://www.nrdc.org/bio/amanda-maxwell/latin-americas-air-pollution-impacts-climate-and-health (accessed on 24 April 2023). [34]

Munich RE (2022), *Hurricanes, cold waves, tornadoes: Weather disasters in USA dominate natural disaster losses in 2021*, https://www.munichre.com/en/company/media-relations/media-information-and-corporate-news/media-information/2022/natural-disaster-losses-2021.html (accessed on 16 February 2023). [49]

Nachtigall, D. et al. (2022), "The climate actions and policies measurement framework: A structured and harmonised climate policy database to monitor countries' mitigation action", *OECD Environment Working Papers*, No. 203, OECD Publishing, Paris, https://doi.org/10.1787/2caa60ce-en. [62]

OCHA (2020), *Latin America and the Caribbean: Natural Disasters 2000-2019*, https://www.humanitarianresponse.info/en/operations/latin-america-and-caribbean/document/latin-america-and-caribbean-natural-disasaters-2000?_gl=1*n0ced7*_ga*MzQ1NTI4NDY4LjE2NzU4NjI2MDE.*_ga_E60ZNX2F68*MTY3NTg2MjYwMS4xLjEuMTY3NTg2MjcwNi42MC4wLjA (accessed on 16 February 2023). [47]

OECD (2023), "Aggregate National Accounts, SNA 2008 (or SNA 1993): Gross domestic product", *OECD National Accounts Statistics* (database), https://doi.org/10.1787/data-00001-en (accessed on 30 May 2023). [6]

OECD (2023), "Green growth indicators", *OECD Environment Statistics* (database), https://doi.org/10.1787/data-00665-en (accessed on 1 May 2023). [3]

OECD (2023), *Income Distribution Database*, https://stats.oecd.org/Index.aspx?DataSetCode=IDD. [13]

OECD (2023), *OECD Environment Statistics - Land Use*, https://www.oecd-ilibrary.org/environment/data/oecd-environment-statistics/land-use_8ecc9c9c-en. [14]

OECD (2023), *OECD Inventory of Support Measures for Fossil Fuels: Country Notes*, OECD Publishing, Paris, https://doi.org/10.1787/5a3efe65-en. [58]

OECD (2022), *Climate Finance Provided and Mobilised by Developed Countries in 2016-2020*, https://doi.org/10.1787/286dae5d-en. [60]

OECD (2022), *Pricing Greenhouse Gas Emissions: Turning Climate Targets into Climate Action, OECD Series on Carbon Pricing and Energy Taxation*. [56]

OECD (2021), *How's Life in Latin America?: Measuring Well-being for Policy Making*, OECD Publishing, Paris, https://doi.org/10.1787/2965f4fe-en. [52]

OECD (2021), *The Economic Benefits of Air Quality Improvements in Arctic Council Countries*, OECD Publishing, Paris, https://doi.org/10.1787/9c46037d-en. [26]

OECD (2021), *Transport Strategies for Net-Zero Systems by Design*, OECD Publishing, Paris, https://doi.org/10.1787/0a20f779-en. [31]

OECD (forthcoming), *GHG Emissions Trends and Targets (GETT) Indicators: Harmonised Quantification of 2030 NDC GHG Emissions Targets*. [19]

OECD et al. (2022), *Latin American Economic Outlook 2022: Towards a Green and Just Transition*, OECD Publishing, Paris, https://doi.org/10.1787/3d5554fc-en. [5]

OICA (2023), *Motorization rate 2020*, https://www.oica.net/category/vehicles-in-use/ (accessed on 16 February 2023). [21]

OPEC (2022), *OPEC Annual Statistical Bulletin 2022*, https://www.opec.org/opec_web/en/publications/202.htm. [8]

PAHO (2023), *Air Quality*, https://www.paho.org/en/topics/air-quality (accessed on 16 February 2023). [24]

Rabatel, A. et al. (2013), "Current state of glaciers in the tropical Andes: a multi-century perspective on glacier evolution and climate change", *The Cryosphere*, Vol. 7/1, pp. 81-102, https://doi.org/10.5194/tc-7-81-2013. [28]

Ramos, V. et al. (2023), "Rivers of South America", *Encyclopaedia Britannica*, https://www.britannica.com/place/South-America/Rivers (accessed on 28 April 2023). [48]

S&P Global (2022), *S&P Global Trucost*, https://www.spglobal.com/esg/trucost. [55]

Samaniego, J. et al. (2021), *Current understanding of the potential impact of Carbon Dioxide Removal approaches on the SDGs in selected countries in Latin America and the Caribbean. Final Report*, Carnegie Climate Governance Initative (C2G)/ Economic Commission for Latin America and the Caribbean (ECLAC). [38]

Sun, X. et al. (2022), "Fast action on short-lived climate pollutants and nature-based solutions to help countries meet carbon neutrality goals", *Advances in Climate Change Research*, Vol. 13/4, pp. 564-577, https://doi.org/10.1016/j.accre.2022.06.003. [17]

Tambutti, M. and J. Gómez (2020), *The outlook for oceans, seas and marine resources in Latin America and the Caribbean: Conservation, sustainable development and climate change mitigation*, Economic Commission for Latin America and the Caribbean (ECLAC), Santiago, https://repositorio.cepal.org/bitstream/handle/11362/46509/4/S2000911_en.pdf. [72]

UN (2018), *2018 Revision of World Urbanization Prospects*, https://population.un.org/wup/. [66]

UN DESA (2023), *Global SDG Indicator Database, indicator 15.5.1*, https://unstats.un.org/sdgs/indicators/database/. [74]

UNDP (2022), *The challenges of climate mitigation in Latin America and the Caribbean: Some proposals for action, UNDP LAC PDS Nº. 40*, UNDP, https://www.undp.org/sites/g/files/zskgke326/files/2023-01/PNUDLAC-working-paper-40%20climate%20EN-final.pdf. [54]

UNDRRR (2020), *Hazard definition and classification review*, https://www.preventionweb.net/hazard-information-profiles?_gl=1%2A8j7ozo%2A_ga%2ANjMwNTA4NzM5LjE2NzY1Njg4MzI.%2A_ga_D8G5WXP6YM%2AMTY3NjU2ODgzMS4xLjEuMTY3NjU2ODk1NC4wLjAuMA.. (accessed on 16 February 2023). [41]

UNICEF (2022), *Atlas sociolingüistico de pueblos indígenas en América Latina*, https://www.unicef.org/lac/informes/atlas-sociolinguistico-de-pueblos-indigenas-en-america-latina (accessed on 16 February 2023). [65]

US EIA (2023), *Natural Gas Reserves*, https://www.eia.gov/international/data/world/natural-gas/dry-natural-gas-reserves?pd=3002&p=0000000000000000000004&u=0&f=A&v=mapbubble&a=-&i=none&vo=value&t=C&g=0000000002&l=48-g8o04n0416o1a008045kk020820001g2800062800420g2047g&l=249--249&s=315532800000&e=1609459200000&. [9]

USGS (2022), *Mineral Commodity Summaries 2022*, https://www.usgs.gov/centers/national-minerals-information-center/mineral-commodity-summaries. [11]

WHO (2022), *Air quality database. Update April 2022*, https://www.who.int/data/gho/data/themes/air-pollution/who-air-quality-database (accessed on 16 February 2023). [33]

WMO (2022), *State of the Climate in Latin America and the Caribbean 2021*, World Meteorological Organization, https://library.wmo.int/doc_num.php?explnum_id=11270 (accessed on 16 February 2023). [68]

WMO (2021), *Atlas of Mortality and Economic Losses from Weather, Climate and Water Extremes (1970–2019)*, https://library.wmo.int/index.php?lvl=notice_display&id=21930#.Y-5nmi_MLIU (accessed on 16 February 2023). [43]

World Bank (2023), *Land area (sq. km) - Latin America & Caribbean, World*, https://data.worldbank.org/indicator/AG.LND.TOTL.K2?locations=ZJ-1W&view=chart (accessed on 16 February 2023). [63]

World Bank (2023), *Urban population (% of total population)*, https://data.worldbank.org/indicator/SP.URB.TOTL.IN.ZS (accessed on 16 February 2023). [64]

World Bank (2022), *Costa Rica's Forest Conservation Pays Off*, https://www.worldbank.org/en/news/feature/2022/11/16/costa-rica-s-forest-conservation-pays-off (accessed on 16 February 2023). [71]

World Bank & ICCI (2013), *On Thin Ice : How Cutting Pollution Can Slow Warming and Save Lives*, https://openknowledge.worldbank.org/handle/10986/16628 (accessed on 16 February 2023). [69]

World Economic Forum (2022), *How hard could climate change hit the global economy, and where would suffer most?*, https://www.weforum.org/agenda/2022/04/climate-change-global-gdp-risk/#:~:text=A%20new%20study%20of%20135,South%20Asia%20most%20at%20risk (accessed on 16 February 2023). [67]

WWF (2020), *Living Planet Report 2020 - Bending the curve of biodiversity loss*, https://livingplanet.panda.org/ (accessed on 16 February 2023). [70]

Zegarra, M. et al. (2020), *Impact of Hurricane Dorian in The Bahamas: A View from the Sky.*. [50]

Notes

[1] Before the COVID-19 pandemic, GDP growth of the LAC region was already more modest (at an annual average of about +0.4% between 2010 and 2019) than in the OECD (about +2.0%) and globally (+3.4%).

[2] Including mining, manufacturing, construction, electricity, water, and gas.

[3] A value of 0 would represent perfect equality (every person receives the same income), and a value of 1 would represent perfect inequality (a single person receives all of the income).

[4] Excluding land use, land use change and forestry.

[5] These include Antigua and Barbuda, Argentina, Bahamas, Barbados, Belize, Bolivia, Brazil, Chile, Colombia, Costa Rica, Cuba, Dominica, Dominican Republic, El Salvador, Grenada, Guatemala, Haiti, Honduras, Jamaica, Mexico, Nicaragua, Panama, Paraguay, Peru, Saint Kitts and Nevis, Saint Lucia, Suriname, Uruguay, and Venezuela.

[6] These include Antigua and Barbuda, Argentina, Barbados, Brazil, Chile, Colombia, Costa Rica, Dominican Republic, Grenada, Guyana, Jamaica, Panama, Paraguay, Peru, Suriname, and Uruguay. Data gathered from countries NDCs, Long-Term Climate Strategies, Laws, Presidential declarations, and other policy documents.

[7] Brazil, Mexico, Argentina, Venezuela, Colombia, Chile, Peru, Ecuador, Bolivia, Paraguay

[8] Percentage changes calculated by IPAC based on data from Climate Watch (2022).

[9] Climate Watch is an open data platform gathering data from multiple datasets, managed by the World Resources Institute. The Climate Watch platform is a contribution to the NDC Partnership, which serves to accelerate the implementation of NDCs through, among others, data resources and expertise.

[10] WRI is a global research organisation focused on global challenges including climate change, energy, food, forests, water, sustainable cities, and the ocean. Its work includes data collection, analysis and engagement governments, businesses, multilateral institutions and civil society groups.

[11] Extreme events recorded are defined as those resulting in either 100 000 or more people affected, 1 000 or more deaths, or at least 2% of GDP in estimated economic damages.

[12] Extreme cyclones are defined as those that occur in a period of 100 years

[13] IUCN categories are not truly hierarchical, but categories I and II are very likely to be more restrictive in the type of activities that are permitted therein.

[14] EUR 30/tonne of CO_2 represents a historic low-end price benchmark of carbon costs in the early and mid-2010s, consistent with a slow decarbonisation scenario by 2060; EUR 60/t represents a low-end 2030 and mid-range 2020 benchmark according to the High-Level Commission on Carbon Prices. EUR 120/t represents a central estimate of the carbon price needed in 2030 to decarbonise by mid-century under the assumption that carbon pricing plays a major role in the overall decarbonisation effort.

Environment at a Glance in Latin America and the Caribbean

SPOTLIGHT ON CLIMATE CHANGE

Environment at a Glance in Latin America and the Caribbean: Spotlight on Climate Change focusses on climate change, looking at trends in greenhouse gas emissions, exposure to climate-related hazards and climate policies. It provides key messages on past progress and remaining efforts to be made in Latin America and the Caribbean. The report draws on the OECD's expertise in environmental data and indicators, on the work of the International Programme for Action on Climate (IPAC) and is part of the OECD Latin America and the Caribbean Regional Programme. The indicators presented come from OECD and other international databases, and reveal substantive gaps in the availability of data on the environment and climate in the region. This interactive report allows users to play with the data and graphics and to download and share them.

Co-funded by
the European Union

PDF ISBN 978-92-64-99592-5

9 789264 995925