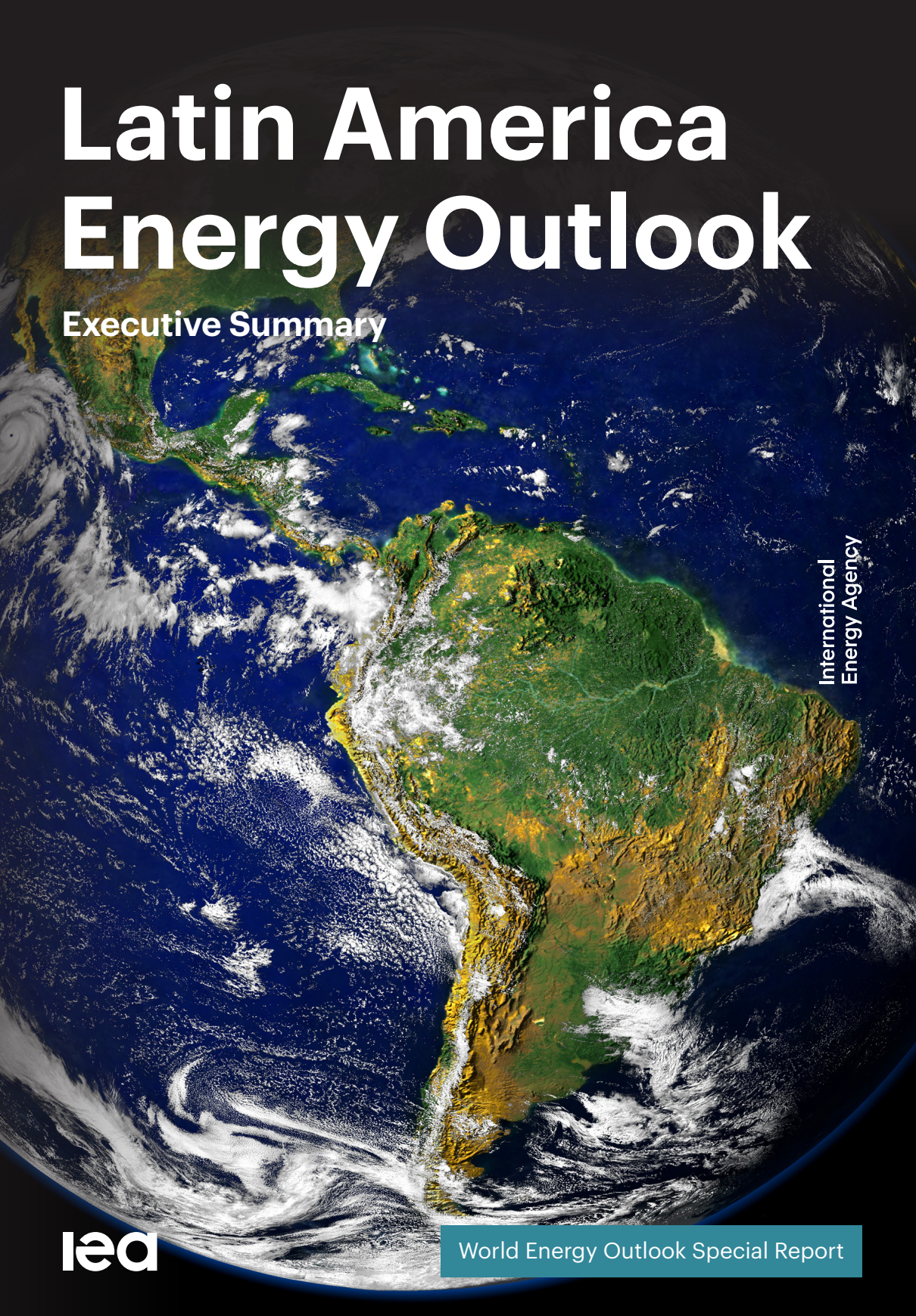
Latin America Energy Outlook

Executive Summary



International Energy Agency

World Energy Outlook Special Report

INTERNATIONAL ENERGY AGENCY

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Latin America and the Caribbean is well placed to thrive as the world moves into a clean energy age

How Latin America and the Caribbean uses its vast resources will shape the region's energy future and the role it plays in the global energy system. Latin America and the Caribbean encompasses a region that is both large and diverse in terms of economic development and natural resources. It is rich in fossil fuels and renewable energy, as well as critical minerals. Whether it is harnessing biofuels in Brazil, hydropower in Brazil, Venezuela, Mexico, Colombia, Argentina and Paraguay, or high-quality solar and wind resources in Brazil, Mexico, Chile or Argentina; producing copper or lithium in Chile, Peru and Argentina, minerals essential to clean energy technologies; or tapping the vast oil and natural gas resources in Venezuela, Brazil, Colombia, Argentina, Mexico or Guyana, Latin America and the Caribbean is well placed to thrive as clean energy transitions move forward and to contribute to global energy security and climate goals.

Fossil fuels account for around two-thirds of the region's energy mix, considerably lower than the 80% global average, thanks to the 60% share of renewables in electricity generation. Hydropower alone accounts for 45% of electricity supply in the region. In Costa Rica and Paraguay, almost all electricity supply is from renewable sources. Fossil fuels dominate in many end-use sectors, and oil is notably the primary fuel used in transport. However, the share of biofuels in road transport is twice the global average. Latin America and the Caribbean accounted for 5% of all global energy-related greenhouse gas (GHG) emissions since 1971, while representing 9% of global GDP over the period. Today, the region is a net exporter of crude oil and coal, but a net importer of oil products and natural gas.

Latin America and the Caribbean today represents 8% of the global population and 7% of the global economy, but it can play an outsized role in the new energy economy. With large oil and gas resources, the region can help diversify oil and gas supply in the near term. It is also making strides in developing and exporting advanced biofuels and low-emissions hydrogen, and is ramping up the production of critical minerals essential to clean energy technologies. The region has all the ingredients for secure, affordable and rapid transitions. Moreover, success in Latin America and the Caribbean can bring many benefits to the world.

Clean energy transitions offer opportunities for stronger economic growth

The economy in Latin America and the Caribbean is emerging from a period of sluggish growth over the past ten years. The region's rate of expansion has been a third of the global average during this period. Substantial debt burdens, fiscal deficits, high inflation and the global energy crisis have all put brakes on economic growth. This has generated echoes of the so-called "lost decade" in the 1980s when regional GDP grew slowly amid debt crises and falling investment.

Stronger economic growth can be unlocked with sound energy policies and resource developments. Economic growth is expected to pick up in the next decade to more than twice the rate of economic development observed over the past decade, as countries strengthen their industrial and services sectors, focus on higher value products, and leverage the region's vast energy and mineral resources, which will also boost the economic competitiveness of energy-intensive sectors. A range of measures are needed to attract foreign direct investment, such as implementing clear regulatory frameworks, streamlining administrative procedures and working closely with development institutions.

Our *Latin America Energy Outlook 2023* – the first IEA outlook for the region – contains in-depth country and regional analysis of energy and climate trends, identifying opportunities and key challenges, as more robust growth returns. This report explores three scenarios. It focuses on the Stated Policies Scenario (STEPS), reflecting today's policy settings, and the Announced Pledges Scenario (APS), which assumes all pledges and targets are achieved in full and on time, including climate goals established by Nationally Determined Contributions. The APS also reflects the net zero emissions pledges made by 16 countries – Antigua and Barbuda, Argentina, Barbados, Brazil, Chile, Colombia, Costa Rica, Dominica, Dominican Republic, Grenada, Guyana, Jamaica, Panama, Peru, Suriname and Uruguay – which together cover 60% of energy-related carbon dioxide (CO_2) emissions and two-thirds of GDP in the region. Progress is also benchmarked against the Net Zero Emissions by 2050 (NZE) Scenario, which lays out a pathway to decarbonise the global energy system by mid-century.

Clean electricity provides a springboard for the region's transition

Ample renewable resources present an opportunity to make the electricity sector in Latin America and the Caribbean – already one of the cleanest in the world – even cleaner. Renewable electricity sources outpace electricity demand growth in all scenarios, raising their share of electricity supply from just over 60% today to two-thirds in 2030 and 80% in 2050 with today's policy settings. Hydropower, the foundation of the region's electricity supply for decades, provides the bulk of electricity today in Brazil, Colombia, Costa Rica, Ecuador, Panama, Paraguay and Venezuela. While its growth prospects are more limited in the future due to environmental and social concerns, hydro represents a huge source of flexibility. This will be critical as the share of solar PV and wind in electricity generation doubles by 2030, from 11% today, and reaches 40% by 2050. Brazil, Mexico, Chile and Argentina are leading the way in solar PV and wind development. Natural gas continues to generate about a quarter of electricity to 2030, while coal and oil decline rapidly. In the APS, the region accelerates the shift to renewables, exceeding a 70% share in 2030, 10 years before the STEPS, and over 90% in 2050.

Regional integration offers additional security and cost benefits as the electricity mix evolves. While the benefits are well understood and progress has been made with bilateral interconnections and jointly owned power plants, cross-border electricity trade remains limited today. Our analysis finds that the benefits of stronger regional integration in Latin America and the Caribbean will increase due to several factors: linking countries with

different shares of wind and solar PV reduces flexibility needs; tapping a wider set of dispatchable resources improves the flexibility of supply; and linking electricity demand and supply from different climate zones provides more resilience to changing conditions.

Electricity becomes more central to the regional economy and is the fastest growing final form of energy in Latin America and the Caribbean. Electricity demand grows by 90% to 2050 with today's policy settings and by 180% to fulfil all pledges and targets, which doubles the share of electricity in total final consumption. Cheap renewables in the region give electricity a cost advantage in many applications over other fuels, particularly natural gas in importing countries. In the APS, the main driver of electricity demand growth is hydrogen production, followed by buildings (including for appliances and air conditioners), the electrification of transport (with almost 16 million electric vehicles, including buses, on the roads by 2030), and growth in industry to produce cleaner iron and steel, aluminium and chemicals. Peak electricity demand rises even faster than average demand in both scenarios, highlighting the need for dispatchable capacity and storage to maintain electricity security.

Policies determine the path ahead for the energy mix in Latin America and the Caribbean

Today's policy settings set a course for modest growth in fossil fuel use in the region in the long term, complemented by renewable energy. As total energy demand outpaces the growth of fossil fuels, their share of the energy mix falls from 67% today to 63% in 2030 and 54% in 2050. On this path, oil use sees modest growth, remaining far and away the dominant fuel in transport, despite more biofuels use and electric vehicles gaining traction. Natural gas also continues to grow, with new demand from industry producing chemicals, iron and steel in Mexico, Argentina and Brazil adding to growing use in transport and buildings, and stable demand in the electricity sector. Coal remains a small part of the energy mix in the region as demand for it declines, with reductions in the electricity sector in Chile, Brazil and Mexico partly offset by higher use in industry. Despite the growth in fossil fuels, renewables meet the vast majority of new energy demand in the region with today's policy settings – led by the expansion of renewable electricity, plus a doubling of biofuels use in transport and greater use of bioenergy in industry. This raises the share of renewables from 28% in 2022 to over 40% in 2050.

Fulfilling all pledges and targets on time sets out a different pathway for Latin America and the Caribbean, leading to a decline in fossil fuel use in favour of low-emissions sources. On this path, consumption of each fossil fuel peaks this decade and then steadily declines. The use of oil is cut by more than half by 2050, with most reductions in transport due to increased availability of public transit, electric vehicles, efficiency gains and cleaner fuels. Brazil leads the way on expanding sustainable biofuel use, while Chile and Mexico grow their electric vehicle fleets. On this path, natural gas use in the region declines by one-third by 2050, with the largest reductions in the power sector in Argentina, Brazil, Mexico, Chile and Colombia. Decarbonising electricity in these countries to fulfil pledges and targets is also the main driver for deeper coal reductions and faster renewables growth in the region.

Energy efficiency measures in the buildings, transport and industry sectors keep energy demand growth in check while delivering a wide range of social benefits. To date, energy efficiency policies are not widespread in the region. Less than a third of countries have minimum energy performance standards in place for industrial motors or household appliances and few have mandatory building energy codes. Better coverage of performance standards across sectors, tighter fuel economy standards and updated energy-related building codes cut final energy consumption growth by a fifth in 2030. Adopting the best available technologies for products such as air conditioners, moderates energy demand growth at little or no cost to consumers.

Large resources enable a dynamic and diversified traditional and cleaner fuel supply in the region

Latin America and the Caribbean produced over 8 million barrels of oil per day (mb/d) **in 2022, exceeding regional demand with a production value of USD 230 billion, with more resources available to step up production.** The largest producers of oil in the region currently - Brazil, Mexico, Colombia, Venezuela, and Argentina – are at various stages of resource development. In Venezuela oil production has declined by three-quarters since 2010; conventional sources in Argentina show signs of decline; output in Brazil increased by close to 40% since 2010 and production recently started in Guyana after a surge of offshore discoveries. Including those, the region holds about 15% of world oil and gas resources. To 2030, oil production in the region outpaces demand growth, adding about 2 mb/d of net exports. Brazil and Guyana both increase oil production by more than 1 mb/d, giving them two of the top-three largest increases in net exports in the world to 2035. However, any new projects would face major commercial risks if the world is on track to deliver net zero emissions by 2050, as oil demand declines rapidly.

The region produced about 5% of global natural gas in 2022 but was a net importer of gas and it remains so in the outlook despite large resources. Natural gas production declines slightly to 2030 in the region under today's policy settings, raising net imports. If pledges and targets are met in full, including to reduce flaring and methane emissions, natural gas production declines steadily but demand falls faster, particularly after 2030, reducing import needs by 30 billion cubic metres (bcm) in 2050 from the level today. Argentina expands gas production in both cases by exploiting unconventional resources, with most of the gas consumed in the region. Production falls in several other countries, notably Trinidad and Tobago. Argentina, Brazil, Mexico, Colombia and Venezuela all have more gas resources that could be exploited if warranted by higher demand, attractive market prices and lower-than-expected production costs.

Latin America and the Caribbean has huge potential to expand the production of low-emissions fuels. Bioenergy is a growing industry in the region and biofuels, in particular, can help meet both energy security and climate targets. Brazil is a prominent producer and consumer of biofuels, with bioethanol used heavily in road transport. With further policy support, biogas and biomethane use could also expand in electricity generation and

transport. Advanced biofuels have significant potential, as an economic competitive export of biojet kerosene. With abundant renewable energy resources, the region has the potential to become a major producer of low-cost and low-emissions hydrogen and related fuels, particularly in Argentina, Brazil, Colombia and Chile. There are already announcements for significant low-emissions hydrogen projects. Beyond traditional applications for hydrogen like refining and chemicals, low-emissions hydrogen would also enable emissions reductions in other industry applications. For example, developing cost-competitive low-emissions iron could provide a major boost to the regional economy and attract foreign investment.

Global transitions open large markets for Latin America and the Caribbean

Significant mineral resources offer opportunities to diversify global supply and deliver economic growth while enabling global clean energy transitions. The region has a third or more of the global reserves for lithium, copper and silver. Revenue from critical minerals production (graphite, bauxite, nickel, zinc, lithium, copper and neodymium) totalled around USD 100 billion in 2022. In the APS, it overtakes revenue from fossil fuel production before 2050. Exports of copper and lithium are set to be especially significant: copper as an essential component of electricity networks, which need to be strengthened and expanded, and lithium to drive the uptake of electric vehicles and battery storage as more variable renewables are integrated into power systems.

The region has resources that position it well for a changing energy system, from tight oil and shale gas to renewables, minerals and metals. Progressing from raw mineral and ore exports up the supply chain to produce refined and processed materials can benefit the region's economy and foster technology development. Producers need to be agile and read markets well to take advantage of new opportunities. In all cases, high standards of environmental, social, governance issues – including attention to methane emissions – will make a huge difference to prospects.

To fulfil national goals and seize global opportunities, the region must close policy gaps, raise investment and put people at the centre of its strategies

There is a significant implementation gap in Latin America and the Caribbean, as today's policy settings lead to rising CO_2 emissions while climate pledges call for deep cuts. Policy gaps need to be filled to bridge the gap between the CO_2 emissions trajectory in the STEPS, which rises from 1 660 million tonnes (Mt) today to 1 850 Mt in 2050, and that in the APS, where emissions fall below 800 Mt by 2050. Our analysis points to renewables, electrification, energy efficiency and other measures to reduce demand as the key areas for more attention from policymakers and stronger implementation measures. Beyond tackling CO_2 emissions, major producers in the region can reduce methane emissions from oil and gas operations by nearly 80% at low cost, and around 40% with no net costs, supporting the Global Methane Pledge that most countries in the region have signed.

Alongside energy, approaches to cut emissions in the region must also give serious attention to land use and agriculture. Today, land use and agriculture produce 45% of regional GHG emissions. After decades of tree cover loss, pledges in the APS lead to an 80% reduction in primary forest deforestation by 2030 and net forest growth of 100 million hectares by 2050. Together with improved resource management practices, land use and agriculture reach net zero greenhouse gas emissions by 2030, with afforestation efforts in Brazil and Mexico playing a key role.

Investment in clean energy needs a major boost to reach the energy-related emissions reductions goals and to pursue international opportunities. In the APS, clean energy investment doubles by 2030 to USD 150 billion and rises fivefold by 2050. The ratio of investment in clean sources to unabated fossil fuels rises from around 1:1 today to 4:1 in the 2030s. Attracting private capital will be critical to achieve this, but challenges include high financing costs, political and regulatory instability, and limited domestic credit capacity. Overcoming these hurdles requires supportive policies, tailored solutions such as hedging instruments, and more concessional financing, especially for energy efficiency and emerging technologies.

A people-centred and inclusive transition calls for universal access to modern energy at affordable prices. Latin America and the Caribbean has one of the highest levels of income inequality, with the richest 10% of the population accounting for 40% of total emissions. About 17 million people remain without access to electricity and 74 million lack access to clean cooking. More needs to be done to achieve universal access on both fronts. Affordable energy is also a key concern. A faster transition to clean energy could reduce energy costs for households, making it easier to end fossil fuel subsidies. However, lower income groups may need support given the higher upfront costs of some clean energy technologies. Clean energy transitions also offer new employment opportunities for workers in the region, with energy jobs set to increase by over 15% to 2030, notably in clean energy technologies and in the critical mineral sector.

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Latin America and the Caribbean is a region that stands out in the global energy sector. It boasts extraordinary natural resources – both fossil fuels and renewable energy – and a significant share of the world's critical minerals. It also has a history of ambitious policy making in pursuit of stronger energy security and greater sustainability that has delivered one of the cleanest electricity mixes in the world. As the region emerges from a period of sluggish economic growth, countries in Latin America and the Caribbean now stand to leverage these resources to revitalise their economies and improve the security and sustainability of energy around the world.

The *Latin America Energy Outlook*, the International Energy Agency's first in-depth and comprehensive assessment of Latin America and the Caribbean, builds on decades of collaboration with partners. In support of the region's energy goals, the report explores the opportunities and challenges that lie ahead. It provides insights on the ways in which the outlook for the region and the biggest global energy trends are deeply intertwined – as well as recommendations on policies that could allow Latin America and the Caribbean to take full advantage of its great potential.