



Country Analysis Brief: Ecuador

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Overview

Table 1. Ecuador's energy overview, 2021

	Crude oil and other petroleum liquids	Natural gas	Coal	Nuclear	Hydro	Other renewables	Total
Primary energy consumption (quads)	0.41	0.01	0.00	--	0.22	0.00	0.65
Primary energy consumption (percentage)	63.4%	1.7%	0.1%	--	34.1%	0.7%	100.0%
Primary energy production (quads)	1.04	0.01	--	--	0.22	0.01	1.28
Primary energy production (percentage)	81.3%	0.9%	--	--	17.5%	0.4%	100.0%
Electricity generation (terawatthours)	5.06	1.19	--	--	25.57	0.51	32.34
Electricity generation (percentage)	15.7%	3.7%	--	--	79.1%	1.6%	100.0%

Data source: U.S. Energy Information Administration, *International Energy Statistics* and staff estimates, and the International Energy Agency, *World Energy Statistics 2022*

Note: Quads=quadrillion British thermal units

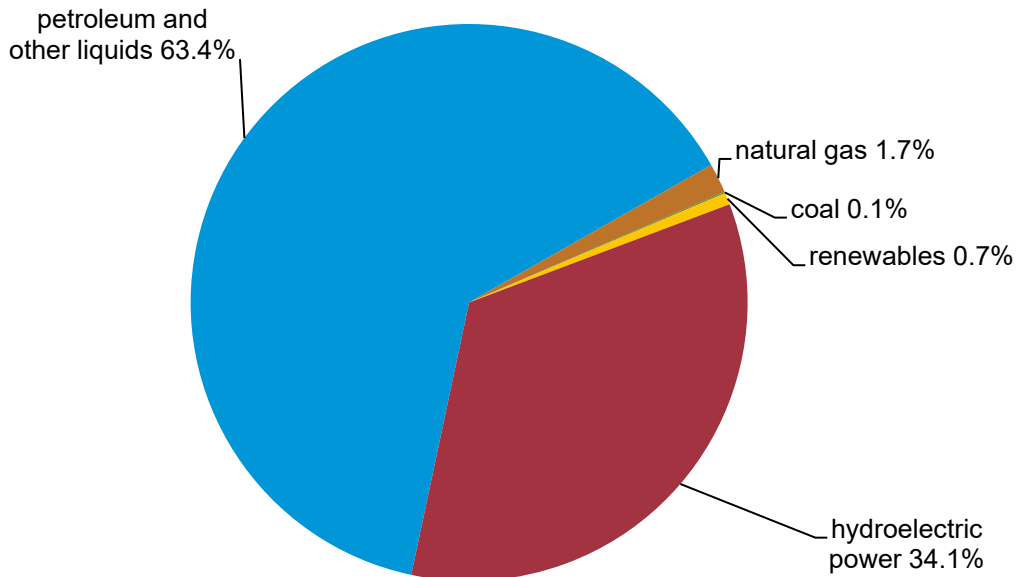
- Petroleum liquids and renewable energy, specifically hydroelectric energy, account for most of Ecuador's energy use (Table 1). Ecuador's energy production increased by a compounded growth rate of 0.5% per year from 2011 to 2021, and renewables accounted for most of the increase. The country's energy consumption also increased by a compounded growth rate of 0.5% per year over the same period, down from 4.9% per year the decade prior.
- Petroleum and other liquids continue to be Ecuador's primary source of energy; crude oil accounted for 63.4% of total energy consumption in 2021. The country has significant oil reserves and is one of South America's top oil producers. Ecuador's global share of petroleum and other liquids produced in 2021 was 0.6%, ranking fifth among oil producers in South America.
- Ecuador's natural gas market is less developed than its oil sector; it has a 0.9% share of total energy production and 1.7% share of energy consumption (Figure 1). Natural gas in Ecuador is mostly used by the industry sector¹.
- Hydropower in Ecuador is a significant source of electricity generation given the country's geographical features, such as the Andes Mountains and the Amazon rainforest. Hydropower accounted for 79.1% of total electricity generation in 2021, up from 55.4% in 2011.²

Figure 1. Map of Ecuador



Data source: U.S. Central Intelligence Agency, [CIA World Factbook—Ecuador](#)

Figure 2. Total primary energy consumption in Ecuador by fuel type, 2021
percentage of total energy consumption

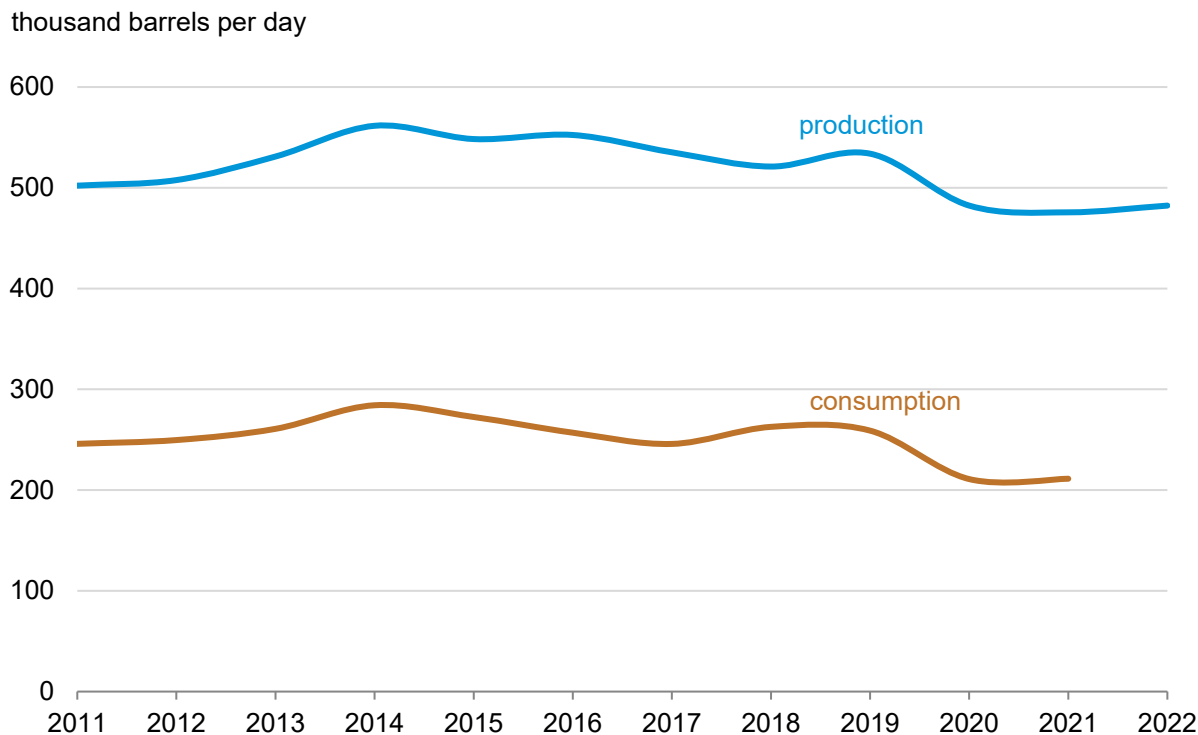


Data source: U.S. Energy Information Administration, *International Energy Statistics*
Note: Non-hydro renewables include geothermal, tide, wave, fuel cell, solar, wind, and biomass and waste.

Petroleum and Other Liquids

- Ecuador held 0.5% of the global share of oil reserves in 2022, making it the fourth highest in Latin America and the Caribbean, with approximately 8.27 billion barrels.³ In 2022, the country produced approximately 482,000 barrels per day (b/d) of petroleum and other liquids (Figure 3). Most of Ecuador's oil is sourced from the Amazon region, specifically the Oriente Basin. Ecuador's production of petroleum and other liquids peaked in 2014 at about 562,000 b/d. Ecuador's oil industry has struggled to maintain production because of aging fields, pipeline disruptions, and environmental concerns.
- Petroecuador, the largest state-owned enterprise (SOE) in Ecuador, oversees the country's oil exploration, production, refining, and marketing. Petroecuador is the country's top oil producer, accounting for an estimated 80% of Ecuador's output via its subsidiary Petroamazonas. Petroecuador controls the country's crude oil processing capacity through Petroindustrial, its refining subsidiary. The government controls the distributor margins for fuels sold to various domestic and international retailers. Petroecuador invested US \$1.9 billion in 2022, a 17% increase over the previous year. This investment included completing 117 wells compared with 64 wells completed in 2021.⁴
- Ecuador's main crude oil pipelines are the Trans Ecuadorian Pipeline (SOTE) and the Heavy Crude Oil Pipeline (OCP). SOTE is operated by the state oil company Petroecuador, and OCP is operated by a private consortium. Both pipelines connect Ecuador's Amazon producing region to refineries and export terminals on the Pacific coast. The 360,000 b/d SOTE pipeline carried an average of 320,000 b/d of medium export grades (24-degree API and 1.59% sulfur content), primarily Oriente, in 2022. It links the Amazon oil fields to the Balao Maritime Oil Terminal and the Esmeraldas refinery. The OCP pipeline, which is more than 300 miles long, transports the heavier Napo export grade (19-degree API and 1.96% sulfur content).⁵ The pipeline has a capacity of 450,000 b/d but transported an average of 150,000 b/d in 2022. The line connects Lago Agrio's Amazonas Terminal to the Esmeraldas OCP Marine Terminal.⁶
- Ecuador's government has maintained its efforts to strengthen the country's hydrocarbon industry. Ecuador's president, Guillermo Lasso, signed an executive decree in July 2021 to privatize the country's oil industry through a series of reforms aimed at selling state-run fields to the private sector. This effort includes selling oil fields to private companies through public tender rounds and continuing to improve Petroecuador's operations.⁷
- In recent years, Ecuador's oil industry has faced numerous challenges. Pipeline disruptions have increased in recent years as a result of accelerated erosion after a nearby waterfall partially collapsed. Both pipelines have also been affected by natural disasters and protests. Landslides ruptured both the SOTE and OCP pipelines in April 2020, resulting in one of Ecuador's worst oil spills. In January 2022, the OCP pipeline was ruptured by falling rocks, resulting in another spill. The spill contaminated over five acres of the Cayambe-Coca National Park. In June 2022, Petroecuador declared *force majeure* as protestors stormed oil fields, demanding reduced fuel prices and economic reforms.⁸ A landslide in the Amazonian province of Napo caused the Marker River Bridge to collapse in late February 2023. Both of Ecuador's pipelines were shut down for safety reasons, even though neither had ruptured. As a result, Petroecuador was forced to close wells and declare *force majeure*, and total crude oil production fell by 17.8% (approximately 2,700 thousand barrels) from January to February 2023. The restriction was later lifted in early March 2023.⁹

Figure 3. Ecuador’s liquid fuels production and consumption, 2011–2022



Data source: U.S. Energy Information Administration, *International Energy Statistics*

Table 2. Ecuador’s oil refineries

Refinery	Operator	Crude oil distillation capacity (thousand barrels per day)	Location
Refinería Estatal de Esmeraldas	Petroecuador	110	Esmeraldas
Refinería La Libertad	Petroecuador	45	Santa Elena
Refinería Shushufindi	Petroecuador	20	Sucumbíos
Total		175	

Data source: *Oil & Gas Journal*, 2022 Worldwide Refining Survey

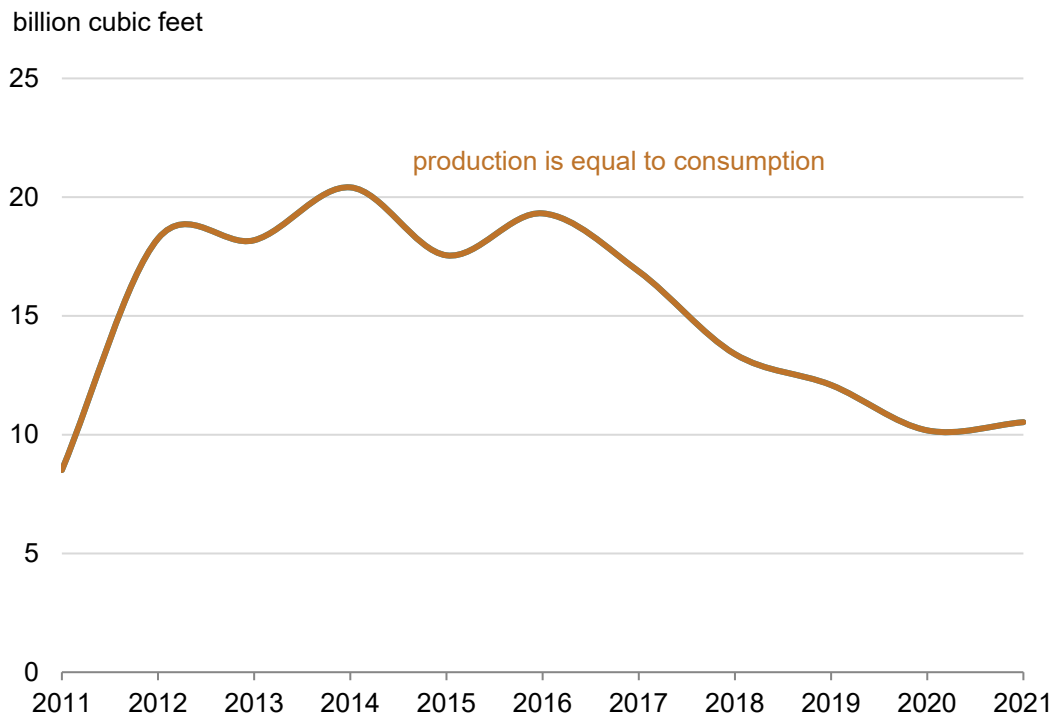
Natural Gas and LNG

- Ecuador’s natural gas reserves are associated with its oil fields. Ecuador had 385 billion cubic feet (Bcf) of proven natural gas reserves as of 2022. Ecuador's natural gas reserves account for about 0.14% of South America's total reserves. Ecuador's natural gas production is small compared with oil production, accounting for less than 1% of total energy production in the country in 2021. Natural gas production in Ecuador has historically received very little

investment. As a result, Ecuador lacks the infrastructure for capturing and marketing natural gas, which has limited natural gas production.

- All of the natural gas produced in Ecuador is consumed domestically. The country’s dry natural gas consumption per capita is the fourth lowest in South America. Ecuador’s natural gas is primarily used by industry for power generation and industrial processes.¹⁰
- Petroamazonas, a Petroecuador subsidiary, operates the Amistad conventional natural gas field, located in shallow water in Ecuador. The field is in Block 6, with a water depth of 203 feet. The Amistad conventional natural gas field recovered 70% of its total recoverable reserves after production peaked in 2014 at 20.4 Bcf. ¹¹ Petroecuador last drilled development wells at the field from October 2012 to April 2015 with Diamond Offshore’s jackup rig called Ocean Spur, which has since been scrapped. Since then, natural gas production declined by 48% through 2021. Natural gas production is estimated to have averaged 18 Bcf in 2022, compared with 11 Bcf in 2021. Nearly all of the production came from the Amistad offshore field; the rest of the natural gas was associated with oil production.¹²
- The government fixes a set price for natural gas in Ecuador. The country has one of the largest subsidies on liquefied petroleum gas (LPG), making LPG price in Ecuador that are significantly lower than international benchmarks.¹³

Figure 4. Ecuador’s dry natural gas production and consumption, 2011–2021



Data source: U.S. Energy Information Administration, *International Energy Statistics*
Note: All natural gas produced in Ecuador is consumed domestically.

Coal

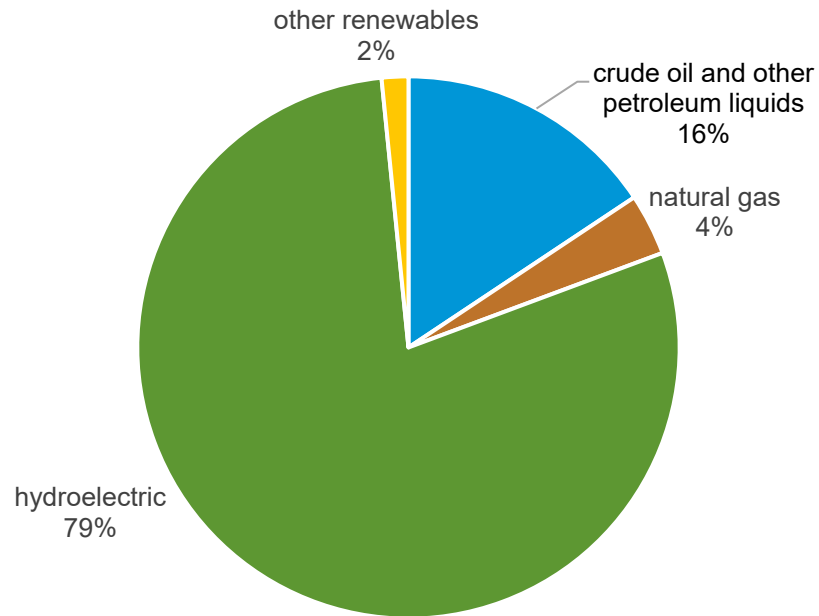
- Coal does not play a significant role in Ecuador's energy market. The country's 26 million short tons of coal reserves are in the Cañar-Azuay Basin,¹⁴ but Ecuador does not produce coal. In 2021, the country consumed 21 thousand short tons,¹⁵ which it imported primarily from the United States, followed by Peru.

Electricity

- Ecuador relied heavily on fossil fuel (which include oil, natural gas, and coal) production for power generation a decade ago, with fossil fuel-powered plants accounting for about 43% of total energy production in 2011. The country now generates electricity from a variety of sources, including hydropower, thermal power plants fueled by natural gas and oil, and renewable energy sources, such as wind and solar. In 2021, hydropower was the primary source, accounting for 79% of the country's electricity generation. The remaining electricity was generated from oil-powered conventional thermal power plants (17%), natural gas (4%), and other renewables (2%). As of 2020, industry accounted for almost 40% of total electricity consumption, followed by the residential sector (32%) and the commercial and public services sector (26%).¹⁶
- Ecuador's mountainous terrain and numerous rivers allow for hydroelectric power generation. The launch of several large facilities since 1983 has solidified the hydropower sector's leading role in Ecuador's electricity generation mix (Table 3). The Coca Codo Sinclair Hydroelectric Plant, located on the Coca River in Napo Province, is Ecuador's largest hydroelectric facility, with a capacity of 1,500 megawatts (MW). The plant went into full operation in 2016 and is critical to meeting the country's electricity demand. Since its commissioning, the plant has been undergoing repairs, and it has run into operational complications because of the erosion from the Coca River.¹⁷
- Ecuador's reliance on hydropower for electricity generation makes the country's power sector vulnerable to droughts and low water levels during the dry season, which generally runs from October to March each year. To compensate, Ecuador currently relies on oil-fired plants for non-hydroelectric power generation. The government is committed towards converting old oil-fired plants into natural gas-fired facilities to meet demand and to reduce costs and emissions. Although natural gas-fired generation has the potential to become a stable complement to drought- and erosion-prone hydropower, Ecuador's lack of domestic natural gas supplies prevents its expansion in the short term.
- Ecuador's government opened the country's largest wind farm in 2023 with a US \$90 million investment. The Huascachaca Wind Farm is the country's largest plant of its kind. The wind farm is located in the province of Loja and consists of 14 wind turbines of 3,571 MW each, supplying 130 gigawatthours (GWh) of energy per year via the 138-kilovolt (kV) Cuenca-Loja line.¹⁸

Figure 5. Ecuador’s power generation supply, 2021

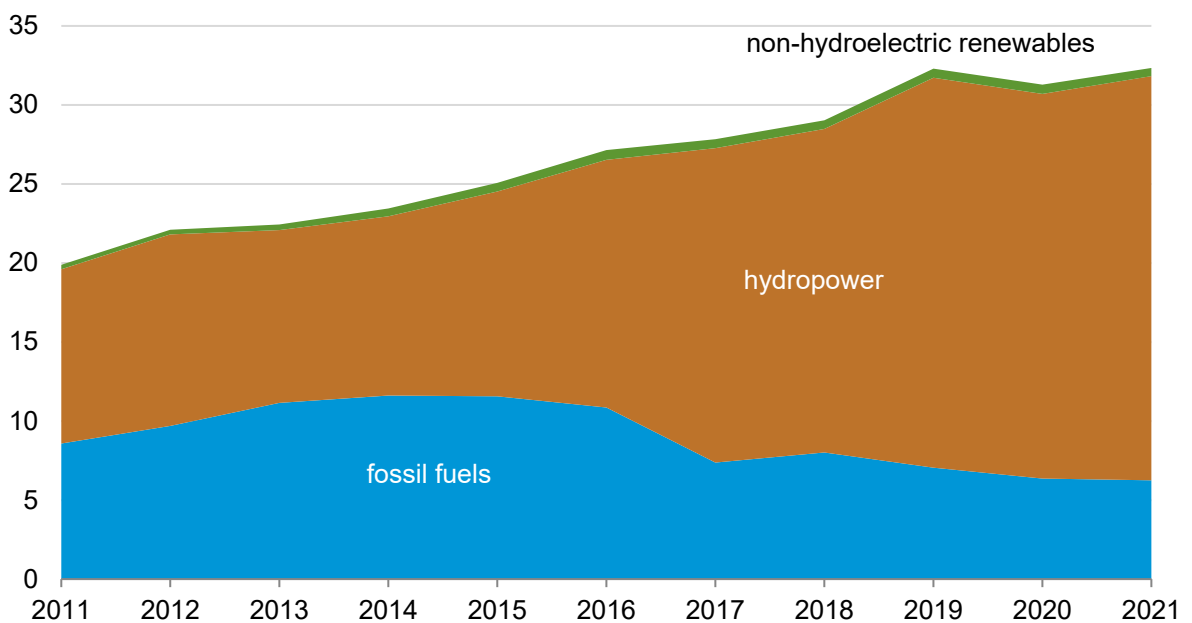
percentage of total energy generation



Data source: U.S. Energy Information Administration, *International Energy Statistics*, and International Energy Agency, *Electricity Information 2022*

Figure 6. Ecuador’s electricity generation by source, 2011–2021

billion kilowatthours



Data source: U.S. Energy Information Administration, *International Energy Statistics*

Table 3. Ecuador’s operating hydroelectric plants

Name	Owner	Start year	Capacity (megawatts)	Type	Location
Central Hidroeléctrica Agoyán	Corporación Eléctrica del Ecuador (CELEC EP)	1987	160	Conventional storage	Tungurahua
Central Hidroeléctrica Coca Codo Sinclair	Corporación Eléctrica del Ecuador (CELEC EP)	2016	1,500	Run-of-river	Napo
Central Hidroeléctrica Delsitanisagua	Corporación Eléctrica del Ecuador (CELEC EP)	2018	180	Run-of-river	Zamora
Central Hidroeléctrica Marcel Laniado	Corporación Eléctrica del Ecuador (CELEC EP)	1987	213	Conventional storage	Guayas
Central Hidroeléctrica Mazár	Corporación Eléctrica del Ecuador (CELEC EP)	2014	170	Conventional storage	Azuay
Central Hidroeléctrica Minas San Francisco	Corporación Eléctrica del Ecuador (CELEC EP)	2019	276	Run-of-river	Azuay
Central Hidroeléctrica Paute	Corporación Eléctrica del Ecuador (CELEC EP)	1983	1,075	Conventional storage	Azuay
Central Hidroeléctrica San Francisco	Corporación Eléctrica del Ecuador (CELEC EP)	2007	230	Run-of-river	Tungurahua
Central Hidroeléctrica Sopladora	Corporación Eléctrica del Ecuador (CELEC EP)	2016	487	Run-of-river	Azuay
Central Hidroeléctrica Toachi-Alluriquin	Corporación Eléctrica del Ecuador (CELEC EP)	...	204	Conventional storage	Toachi
Total			4,495		

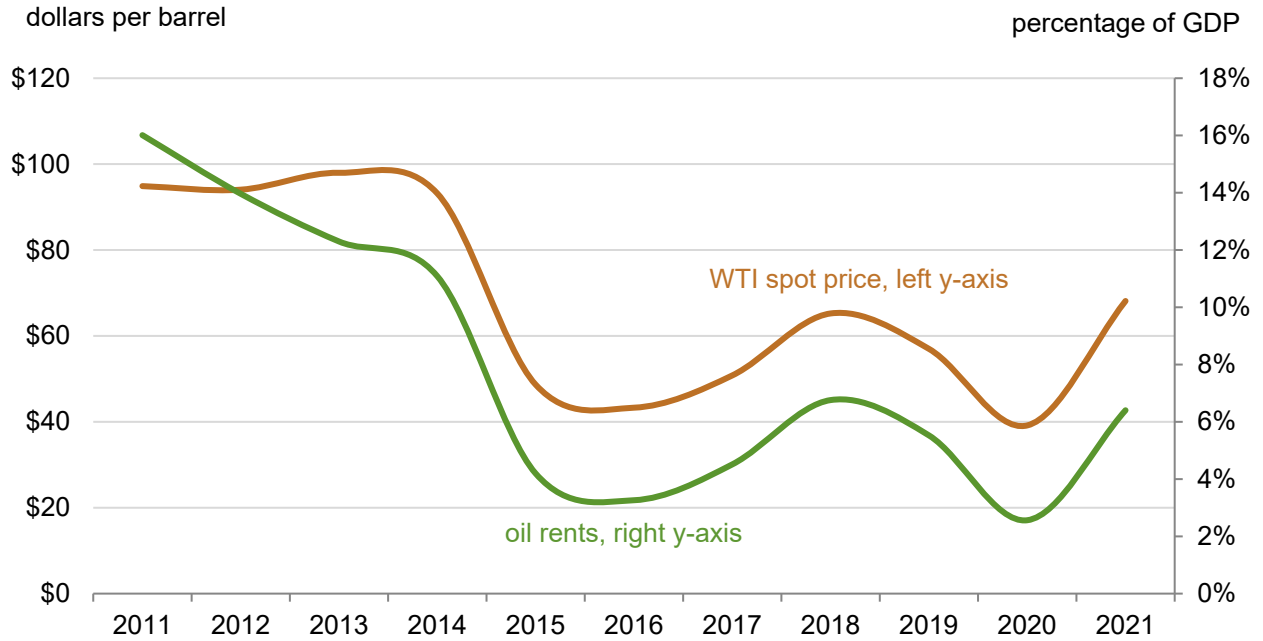
Data source: Global Energy Monitor, Global-Hydropower-Tracker, May 2023

Energy Trade

- Ecuador’s oil rents (value of crude oil production minus total costs of production) declined from 16% of GDP in 2011 to 6.4% of GDP in 2021, following a 28% decrease in the crude oil price (Figure 6). During the same period, Ecuador's export diversification increased, as measured by the United Nations (Figure 7).
- Ecuador's crude oil production remains the country's most important export, accounting for 27% of total exports in value. In 2022, about 52% was exported to Latin America and the Caribbean, 40% to North America, 7% to Asia Pacific, and 1% to Europe. Ecuador’s main export destinations were the United States (40%), Panama (38%), and Chile (9%). Ecuador was the second-highest non-OPEC source of foreign oil for the U.S. West Coast (PADD 5) in 2022, behind only Canada. As a result, Ecuador is a regionally significant source of oil for the U.S. West Coast, which is isolated from the rest of the continent because of a lack of overland pipelines.
- To meet domestic demand, Ecuador imports refined petroleum products. In 2022, ultra-low sulfur diesel (ULSD) accounted for 25% of total oil and natural gas imports, finished gasoline accounted for 23%, and propane accounted for 19%. Total oil and natural gas imports in 2022 arrived mainly from the United States (68%), followed by Panama (7%) and South Korea (6%).
- The United States is Ecuador's largest supplier of LPG. The Panama Canal expansion that began in 2007 facilitated the flow of LPG from the U.S. Gulf Coast into Ecuador.
- Ecuador does not export natural gas. Ecuador imported 2 million cubic feet of liquefied natural gas (LNG) in January 2022 in two 40-foot ISO containers designed for storage and transportation. The cargo from Panama was Ecuador's first import of LNG in its history.¹⁹
- Ecuador has electricity transmission grid interconnections with Peru and Colombia. Historically, Ecuador imported electricity mainly from Peru to supplement its domestic supply. Electricity

imports have declined since 2017 after the introduction of hydroelectric plants in Ecuador. Since 2020, Ecuador has become a net exporter of electricity, exporting to Peru and Colombia during times of surplus generation.

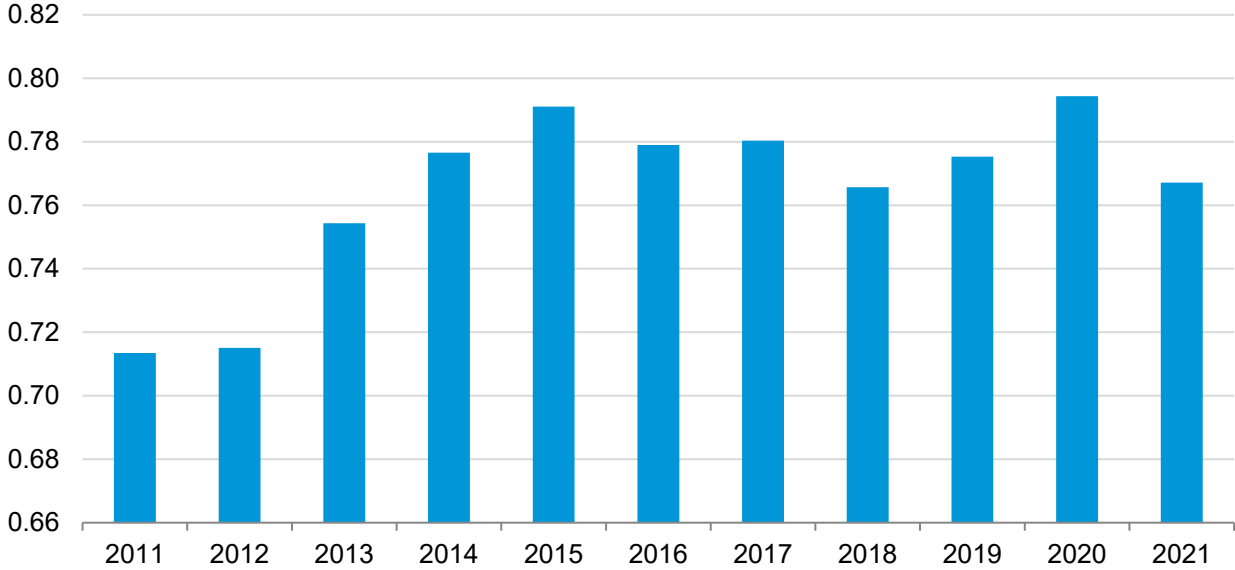
Figure 7. Ecuador’s oil rents compared with the West Texas Intermediate (WTI) spot price, 2011–2021



Data source: U.S. Energy Information Administration and World Bank, *World Development Indicators*
 Note: Oil rents represent the value of crude oil production minus total costs of production. WTI determines the price at which oil is sold and is used to calculate oil rents.

Figure 8. Ecuador’s merchandise exports diversification index, 2011–2021

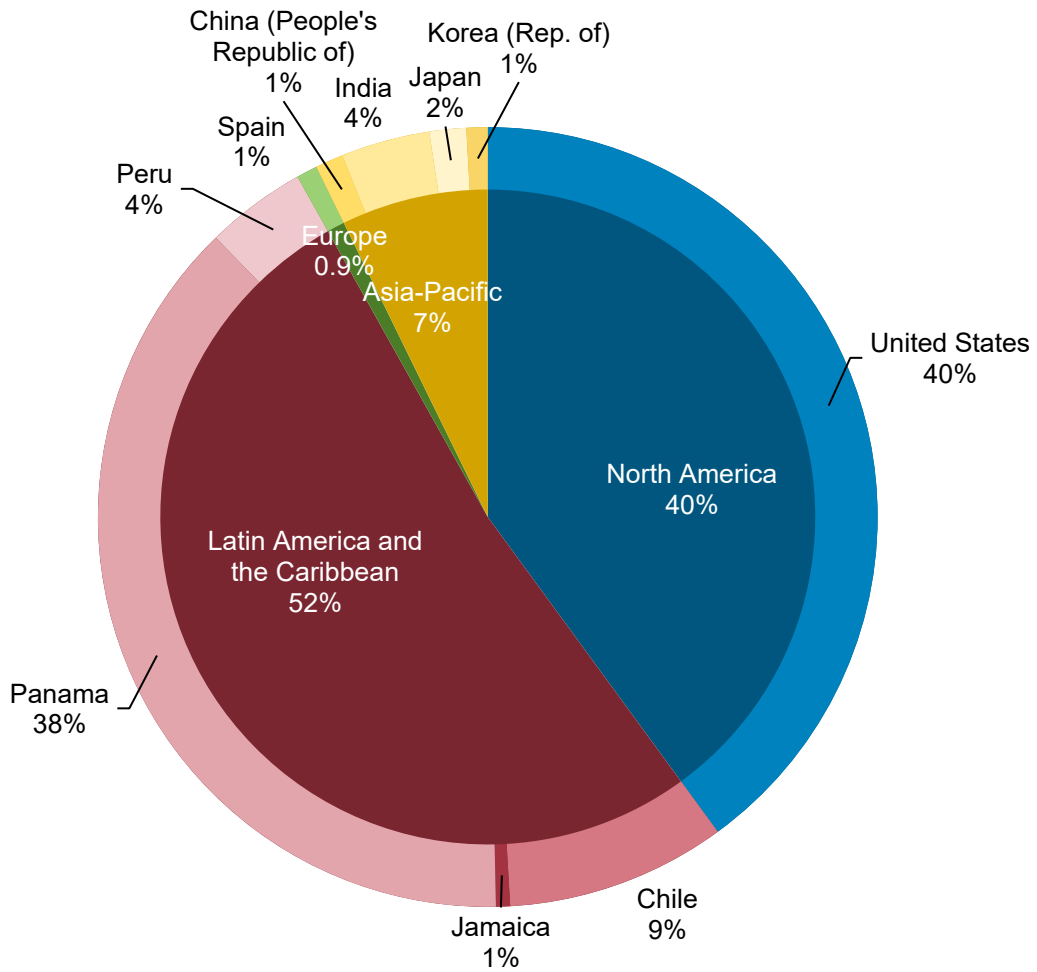
0 = low diversification; 1 = high diversification



Data source: United Nations Conference on Trade and Development (UNCTAD) secretariat calculations, based on UNCTADStat merchandise trade matrix
Note: The diversification index indicates to what extent the structure of exports by product of a given economy or group of economies differs from the world pattern.

Figure 9. Ecuador's crude oil exports by region and country, 2022

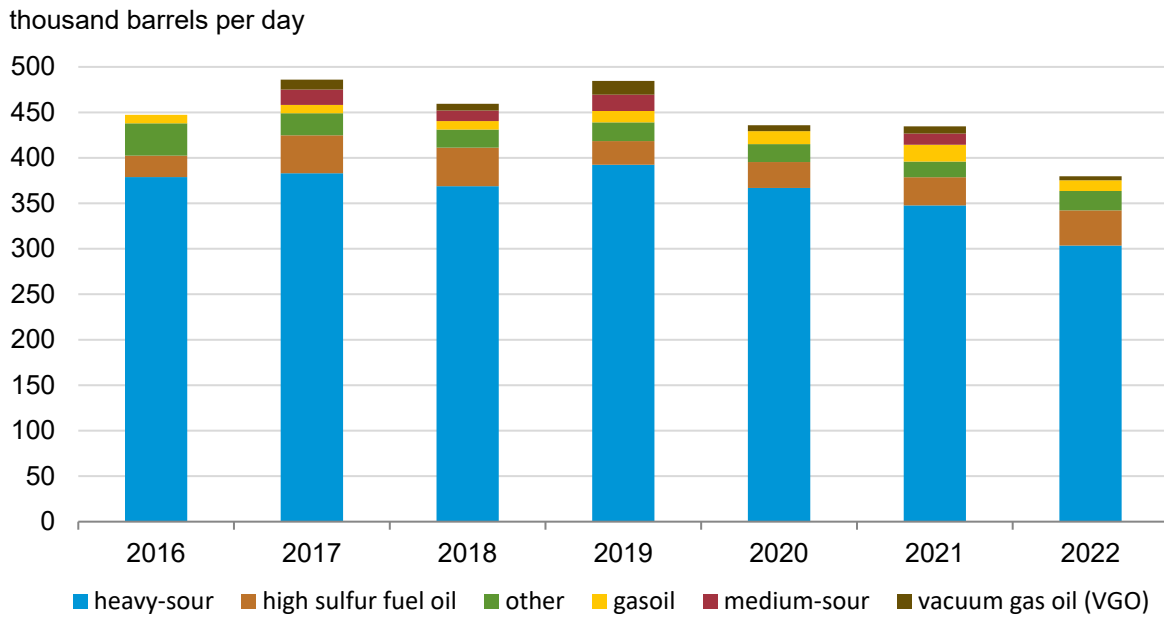
percentage of total crude oil exports



Data source: Global Trade Tracker, provided by Zen Innovations AG © 2023

Note: Regional totals may not equal the sum of the countries due to independent rounding.

Figure 10. Ecuador’s oil exports, 2016–2022

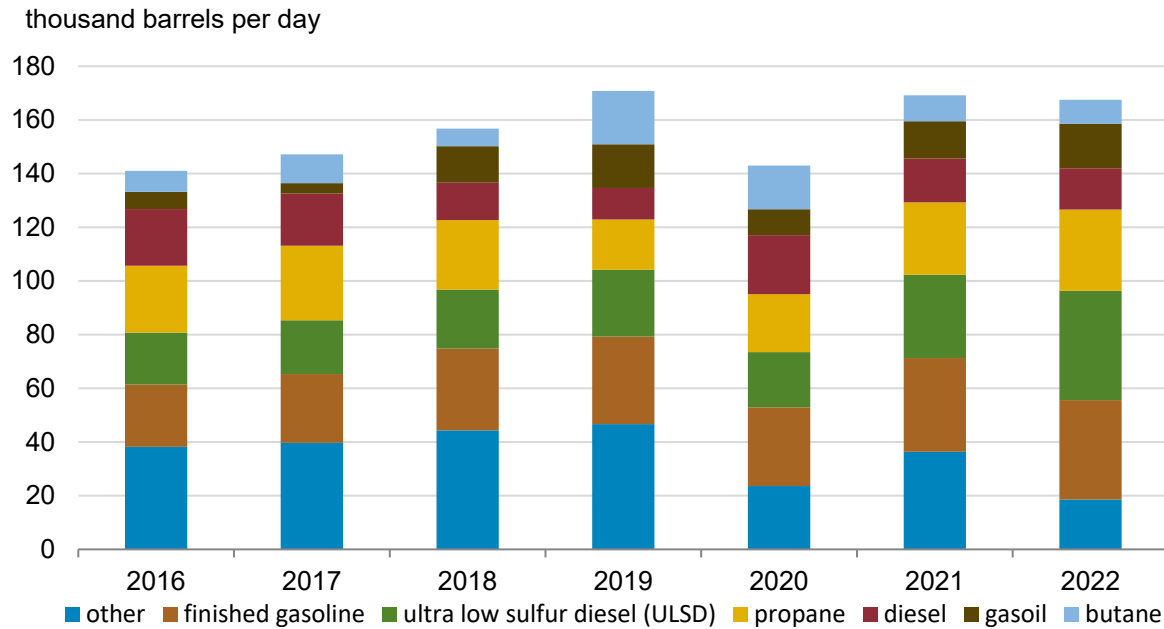


Data source: Vortexa Ltd.



Note: *Other* includes biodiesel feedstock, blending components, chemicals, diesel, finished gasoline, heavy naphtha, light naphtha, low-sulfur oil, lube oils, jet fuel, other biodiesel or edible oils, and ultra-low sulfur diesel (ULSD).

Figure 11. Ecuador’s oil imports, 2016–2022



Data source: Vortexa Ltd.



Note: *Other* includes high-sulfur fuel oil, biodiesel feedstock, light naphtha, chemicals, lube oils, blending components, dirty condensates, other biodiesel or edible oils, and olefins or other chemicals.

