



# 2015 Minerals Yearbook

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**ECUADOR [ADVANCE RELEASE]**

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# THE MINERAL INDUSTRY OF ECUADOR

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The Organization of the Petroleum Exporting Countries (OPEC) reported that Ecuador maintained its position as the fifth-ranked petroleum producer in Latin America and had the fourth largest proven reserves of petroleum in Latin America in 2015. The country accounted for about 5.6% of Latin America's total crude petroleum production in 2015. Most of Ecuador's petroleum reserves are located in the Oriente Basin of eastern Ecuador. Auca and Shushufindi are the country's most prolific oilfields, and they are located in the most productive petroleum blocks, which are located in the northeastern part of the country. Hydrocarbon resources are exclusively owned by the state. The country's national petroleum company, Empresa Pública de Hidrocarburos del Ecuador (EP Petroecuador) and its subsidiaries accounted for most of the petroleum production in Ecuador. The remaining production came from fields operated by international petroleum companies from Argentina, China, Italy, and Spain. Other mineral commodities produced in the country included clay (including kaolin), feldspar, gold, limestone, pumice, silver, and steel. Empresa Nacional Minera del Ecuador (ENAMI), a Government-owned entity, identified numerous mineral resources, including copper, gold, iron ore, molybdenum, silver, and titanium. These resources are located principally in the Provinces of Bolivar, Esmeraldas, Imbabura, Napo, Pinchincha, Sucumbios, and Zamora-Chinchipe (Empresa Nacional Minera del Ecuador, 2016a, b; Organization of the Petroleum Exporting Countries, 2016, p. 22, 28; U.S. Energy Information Administration, 2016a).

Ecuador, however, faced significant economic challenges owing to the decrease in oil prices and decreased tax revenues. In 2015, the Government focused on diversifying its economy by investing in the development of the country's untapped nonfuel mineral resources. The country's national assembly passed the Organic Law for Production Incentives and Tax Fraud Prevention in December 2014; the principal objective of the new law is to attract foreign direct investment (FDI) to such projects as road, port, and air transport infrastructure, and mining projects. The law offers incentives, such as reduction of the income tax rate in the mining sector to 22% of revenue. Presidential Decree 475, published in October 2014, revised the windfall profit tax calculation. The windfall profit tax will not apply until a company has recouped all the cumulative investment in the development of its mining project (Banco Central del Ecuador, 2016e, p. 1; U.S. Department of State, 2016, p. 4–5).

In 2015, the Government of Ecuador created the Ministry of Mines (Executive Decree No. 578) in an effort to better manage the country's mineral resources. The Government estimated that only about 8% of its territory had been explored for mineral deposits. The Ministry of Mines was responsible for negotiating service contracts for exploration and mining activities as well as granting concession contracts. Prior to the creation of the new ministry, the Ministry of Non-Renewable Resources was the

authority responsible for managing the mining and petroleum sectors (Banco Central del Ecuador, 2016e, p. 1; Empresa Nacional Minera del Ecuador, 2016a).

## Minerals in the National Economy

In 2015, Ecuador's nominal gross domestic product (GDP) remained about the same as in 2014, at \$100.2 billion. The country's year-on-year rate of growth of the GDP in 2015 was 0.2% compared with 4.0% in 2014. The industrial manufacturing sector accounted for about 15% of the country's GDP; the construction sector, about 11%; and the mining and quarrying sector (including hydrocarbons), about 5%. Despite its potential for gold, silver, and base-metal mining, the country was only a marginal producer of precious metals in 2015. The value of mining and quarrying activities (not including hydrocarbons) accounted for less than 1% of the nominal GDP of Ecuador. In 2015, the value of the mineral sector decreased by about 16% to \$247.5 million compared with \$296.1 million in 2014 (Agencia de Regulación y Control Minero, 2016a; Comisión Económica para América Latina y el Caribe, 2016).

In 2015, the mineral sector in Ecuador continued to be dominated by the petroleum industry, which accounted for more than one-third of the country's total exports, in terms of value. The value of mineral exports in 2015 (including the value of exports of copper concentrates, gold, lead, and silver concentrates; crude petroleum; and other unspecified minerals) was \$7.1 billion compared with \$14.1 billion in 2014. Crude petroleum accounted for about 90% of the total value of mineral exports in 2015. Crude petroleum export revenues, however, decreased significantly by almost 50% compared with those of 2014, causing a deficit in the country's budget. Imports of unspecified mineral products accounted for about 20% of total imports, or \$4.2 billion compared with \$6.8 billion in 2014 (Banco Central del Ecuador, 2016b; Organization of the Petroleum Exporting Countries, 2016, p. 28).

In 2015, Ecuador's FDI inflows reached \$1.3 billion, which was an increase of about 68% compared with that of 2014. The total amount of FDI directed towards mines and quarries was \$559.8 million compared with \$685.6 million in 2014, which was a decrease of 18.3%. Despite Ecuador's openness to FDI, the country's overall investment climate remained challenging owing to investment disputes, primarily in the energy sector where investment policies had been subject to frequent changes. Several United States companies conducting business in Ecuador's petroleum sector filed for international arbitration owing to investment disputes. In 2015, a United States Federal appeals court upheld a ruling from an international arbitration tribunal awarding Chevron Corp. of the United States a \$96 million award. Chevron filed the international arbitration case in the Permanent Court of Arbitration, located in The Hague, Netherlands, in December 2006. The decision resolves seven commercial claims that Chevron filed in Ecuador.

The dispute originated from an agreement that called for Texaco Petroleum Co. of the United States, later acquired by Chevron, to develop oilfields in exchange for selling oil to the Government of Ecuador at below-market rates. The company alleged, in part, that Ecuador had overstated its domestic oil consumption needs and had appropriated more crude petroleum than it was entitled to (Thomson Reuters, 2015; Banco Central del Ecuador, 2016a; Bloomberg BNA, 2016; U.S. Department of State, 2016, p. 3, 9).

## Production

Production of silver increased by 159% to 1,494 kilograms (kg) in 2015 compared with that of 2014. Excluding feldspar, kaolin, and zeolites, production of all reported industrial minerals decreased in 2015. Kaolin production increased by 59% to 63,829 metric tons (t) and feldspar production increased by 35% to 247,253 t. Production of carbon dioxide decreased by 64% in 2015 compared with that of 2014; clays (unspecified) decreased by 38%; construction materials (unspecified), by 57%; limestone, by 39%; and pumice, by 42%. Production of natural gas decreased by 14% to 497 million cubic meters. Overall, total production of refinery products remained about the same in 2015 as in 2014. Data on mineral production are in table 1.

## Structure of the Mineral Industry

Empresa Nacional Minera del Ecuador (ENAMI), which was established in 2010, was the state-owned mining company in charge of managing the country's nonrenewable mining concessions. EP Petroecuador was the state-owned petroleum company in charge of the exploration, production, storage, and refining of crude petroleum. Table 2 is a list of major mineral industry facilities (Empresa Nacional Minera del Ecuador, 2016b; Empresa Pública de Hidrocarburos del Ecuador, 2016).

## Commodity Review

### Metals

**Copper.**—In 2015, construction commenced at the \$1.4 billion Mirador copper project located in the Province of Zamora-Chinchipe. Mirador, which was the country's first large-scale open pit mine, was estimated to contain reserves of about 3 million metric tons of copper, 90,720 kg of gold, and 709,000 kg of silver, and was being developed by Ecuacorriente S.A. Ecuacorriente was a subsidiary of China's CRCC-Tongguan consortium. CRCC-Tongguan was, in turn, a joint venture of Chinese state-owned companies Tongling Non Ferrous Metals and China Railways Construction Corp. The project was expected to generate 3,000 direct jobs in the construction phase and 1,000 mining jobs during operation. The mine was expected to begin producing copper concentrates in May 2018, with an annual production capacity of 62,200 metric tons per year (Agencia de Regulación y Control Minero, 2016a, b; Business News America Ltda., 2016; S&P Global Market Intelligence, 2016).

**Gold.**—In 2015, gold production in Ecuador totaled 7,723 kg, generating \$218 million in revenue. The Provinces of Azuay and El Oro accounted for 86% of this production and for about 95% of gold revenues. The country's gold production capacity

was expected to increase as Lundin Gold Inc. of Canada acquired mining concessions in southeastern Ecuador, including the Fruta de Norte gold project for \$240 million. The company's property consisted of 33 mining concessions covering an area of about 75,000 hectares (ha), of which the Fruta del Norte project accounted for three concessions and covered an area of about 5,000 ha. A feasibility study of the Fruta del Norte project was underway and was expected to be completed in the second quarter of 2016 (table 1; Agencia de Regulación y Control Minero, 2016a; Lundin Gold Inc., 2016, p. 3–5).

### Industrial Minerals

**Feldspar.**—In 2015, the Provinces of Azuay, El Oro, and Zamora-Chinchipe accounted for 93% of the feldspar produced in the country. In terms of production value, the Province of Zamora-Chinchipe accounted for about 50% of the total value of 2015 feldspar production. Feldspar production in Ecuador had gradually increased since 2011 as the economic conditions continued slowly to improve (Agencia de Regulación y Control Minero, 2016a).

### Mineral Fuels and Related Materials

**Natural Gas.**—In 2015, Ecuador's natural gas reserve estimate was 10.9 billion cubic meters, which remained unchanged from that of 2014. Marketed production of natural gas, which included gross withdrawals from reservoirs less the quantities used for reservoir repressuring and the quantities vented or flared, was 497 million cubic meters in 2015 compared with 578 million cubic meters in 2014. Most of the domestically produced natural gas in Ecuador was processed at the Amistad field at a gas plant operated by EP Petroecuador in the Gulf of Guayaquil. The country reported no natural gas exports in 2015 (table 2; Organization of the Petroleum Exporting Countries, 2016, p. 100, 102; U.S. Energy Information Administration, 2016b).

**Petroleum.**—In 2015, Ecuador produced about 543,100 barrels per day (bbl/d) of crude petroleum compared with 556,600 bbl/d in 2014, which was a decrease of about 2.4%. The country accounted for less than 1% of the world's total crude petroleum production and was the third lowest oil-producing OPEC member in 2015. Petroleum output from state-owned companies reached 154 million barrels (Mbbbl) compared with 158 Mbbbl in 2014. Production from private companies decreased by 10% in 2015 to 44 Mbbbl. Ecuador's crude petroleum reserve in 2015 was 8.3 billion barrels, which remained unchanged from that of 2014. There were 7 active oil rigs in Ecuador in 2015 compared with 41 in 2014. Ecuador's drilling rig industry was hampered by low oil prices (Banco Central del Ecuador, 2016a, d; Organization of the Petroleum Exporting Countries, 2016, p. 22–23, 28).

**Refinery Products.**—Ecuador's total production of refinery products in 2015 increased to 66 Mbbbl, or by 1.5% compared with that of 2014. Gasoline accounted for about 44% of the derivatives obtained in refineries. The nation's refinery capacity remained constant at 175,000 bbl/d (tables 1, 2; Banco Central del Ecuador, 2016c; Organization of the Petroleum Exporting Countries, 2016, p. 32).

## Outlook

The Government of Ecuador was open to attracting FDI in nonfuel mineral mining in order to reduce its dependency on revenues from the petroleum industry. The country has been active in reorganizing its mining sector since 2009 and is poised to advance mining projects, as only about 8% of its territory had been explored for mineral deposits. Ecuador will start to improve the road and electric power infrastructure in the interior of the country, especially in remote mountain regions where some of the largest mineral deposits are located. The country is beginning to establish a larger scale mining industry, as a few metal mining companies, including Ecuacorriente and Lundin Gold, seemed positioned to start production in the foreseeable future.

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TABLE 1  
ECUADOR: PRODUCTION OF MINERAL COMMODITIES<sup>1</sup>

(Metric tons unless otherwise specified)

Commodity <sup>2,3</sup>	2011	2012	2013	2014	2015
<b>METALS</b>					
Copper, mine output, Cu content	210	--	208 <sup>r</sup>	131 <sup>r</sup>	--
Gold, mine output, Au content	kilograms 4,923	5,319	8,676	7,322	7,723
Silver, mine output, Ag content <sup>4</sup>	do. 1,589	2,934	1,198	577	1,494
Steel, crude	525,000	536,000	562,000	667,000 <sup>r</sup>	723,000
<b>INDUSTRIAL MINERALS</b>					
Carbon dioxide (CO <sub>2</sub> )	kilograms 512	415	295	229	82
Cement, hydraulic	thousand metric tons 5,700	6,025	6,700 <sup>r</sup>	6,600 <sup>r</sup>	6,200
Clay:					
Kaolin <sup>4</sup>	95,061	42,564	100,195	40,236	63,829
Unspecified	thousand metric tons 2,016	1,950	1,413	776 <sup>r</sup>	480
Construction materials	thousand cubic meters 12,386	13,726	10,653	13,971	6,073
Feldspar	103,948	152,590	210,142	183,259	247,253
Limestone	thousand metric tons 5,309	6,319	6,838	6,319	3,862
Pumice	do. 802	951	1,735	1,729	1,008
Sand, iron	27,061	7,630	2,616	408	--
Zeolites	--	28	--	--	--
<b>MINERAL FUELS AND RELATED MATERIALS</b>					
Gas, natural, marketed	million cubic meters 241 <sup>r</sup>	517	515	578	497
Petroleum:					
Crude	thousand 42-gallon barrels 182,357 <sup>r</sup>	184,323 <sup>r</sup>	192,119 <sup>r</sup>	203,159 <sup>r</sup>	198,231
Refinery products:					
Diesel fuel	do. 15,629	12,215	10,897	9,607	9,734
Distillate fuel oil	do. 9,917	9,048	8,718	9,167	8,698
Residual fuel oil	do. 10,753	8,238	6,784	1,037	2,788
Gasoline <sup>5</sup>	do. 20,289	22,771	23,832	24,987	29,099
Liquefied petroleum gas	do. 3,045	2,674	2,604	1,975	1,522
Other	do. 13,002	16,704	16,843	18,443	24,077
Total	do. 72,635	71,650	69,678	65,216	66,184

<sup>r</sup>Revised. do. Ditto. -- Zero.

<sup>1</sup>Table includes data available through September 12, 2016.

<sup>2</sup>In addition to the commodities listed, some additional commodities were produced, including barite, bentonite, gravel, iron, marble, molybdenum, sulfur, and titanium, but available information was inadequate to make reliable estimates of output.

<sup>3</sup>Reported by Agencia de Regulación y Control Minero.

<sup>4</sup>Reported by the Central Bank of Ecuador.

<sup>5</sup>Data for gasoline were reported as a sum total of two grades (octane 87 and 92).

TABLE 2  
ECUADOR: STRUCTURE OF THE MINERAL INDUSTRY IN 2015

(Thousand metric tons unless otherwise specified)

Commodity		Major operating companies and major equity owners	Location of main facilities	Annual capacity
Cement		Holcim Ecuador S.A. (Holcim Ltd., 92.2%)	Cerro Blanco plant, Guayaquil, Guayas Province, and San Rafael grinding plant, Latacunga, Cotopaxi Province	5,500
Do.		Unión Andina de Cementos, 98.5%	Cement plant near capital city of Quito, Pichincha Province	1,600
Do.		Cemento Chimbarazo CA (Unión Cementera Nacional, UCEM, C.E.M), 100%	Kriobamba, Chimborazo Province	1,000
Do.		C.E.M. Industrial Guapan S.A., 100%	Agozes, Canar Province	600
Copper		NA	El Oro Province	1
Gold	kilograms	Lundin Gold Inc., 100%	Fruta del Norte Mine, Santiago Province	9,700
	do.	Dynasty Metals and Mining Inc., 100%	Zaruma gold mine, El Oro Province	2,200
Do.	do.	Bella Rica Mining Cooperative	Bella Rica Mine and La Guanache-Tres de Mayo Mine, Azuay Province	3,000
Do.	do.	Elipe S.A., 90%	Cabo de Hornos concessions, Portavelo and Zaruma Provinces	2,000
Natural gas	million cubic meters	Empresa Pública de Hidrocarburos del Ecuador (EP Petroecuador) (Government, 100%)	Amistad field, Gulf of Guayaquil	500
Petroleum:				
Crude	thousand 42-gallon barrels	Petroamazonas EP [Empresa Pública de Hidrocarburos del Ecuador (Government, 100%)]	About 26 active fields, led by Auca, Orellana Province, Sacha, Sucumbios Province, and Shushufindi, Napo Province	200,000
Do.	do.	Petroamazonas EP [Empresa Pública de Hidrocarburos del Ecuador (EP Petroecuador) (Government, 100%)]	About 85 active fields led by fields in the Amazon basin with operations in Guayas, Napo, Orellana, and Sucumbios Provinces	105,000
Do.	do.	Operaciones Rio Napo [Empresa Pública de Hidrocarburos del Ecuador (EP Petroecuador) (Government, 100%)]	Sacha oilfield	21,000
Refinery products	thousand 42-gallon barrels per day	Empresa Pública de Hidrocarburos del Ecuador (EP Petroecuador) (Government, 100%)	Esmeraldas refinery, Esmeraldas Province	110
Do.	do.	do.	La Libertad refinery, Santa Elena Province	45
Do.	do.	do.	Shushufindi Industrial Complex	20
Do., do. Ditto.				