

THE MINERAL INDUSTRY OF ECUADOR

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In 2004, the mineral industry of the Republic of Ecuador was still in a nascent stage, especially with respect to the mining of metallic minerals. This was despite the fact that gold has been mined in Ecuador since precolonial times and despite the estimations of many companies engaged in extensive exploration that deposits of other metals (such as copper and silver) exist in sufficient abundance to form the basis of a modern metal mining industry. In 2004, gold mining dominated the nonfuel minerals sector, but production of limestone for cement and glass manufacture was also of significant value to the economy of Ecuador. All gold mining operations were small scale and utilized very little modern mining technology. Thus, the mining methods were considered artisanal, and the small-scale mining operations were described as artisanal mines. Artisanal mines were widespread throughout Latin America, and the artisanal miners in Ecuador were mostly former employees or family members of the former employees of *Compañía Industrial Minera Asociada (CIMA)*, which was both publicly and privately owned and was the last large-scale mining company in the country. The most valuable industrial minerals that were mined in 2004 were, in order of decreasing value, feldspar, pumice, clays (including kaolin), and barites (Sandoval, 2002, p. 3; Sutcliffe, 2005).

In 2004, the economy of the Republic of Ecuador expanded in real terms, mostly owing to the completion of a new oil pipeline and the approximate 30% increase in the annual average price of petroleum compared with that of 2003. In 2004, the country's gross domestic product (GDP) based on purchasing power parity was about \$54 billion, which was 9.7% higher than in 2003; during the same timeframe, the real GDP increased by 6.9% and the country's index of inflation increased by 2.7%. These figures represented the highest increase in the country's real GDP since 1988 and the lowest increase in the rate of inflation within the country since at least before 1980, which implied the highest increase of real income in Ecuador in more than two decades. Growth in the value of the domestic production of nonfuel mineral commodities was slightly less than 2% in spite of higher prices for most of the mineral commodities listed above compared with those of 2003. This situation was possible because exploration still dominated the nonfuel minerals sector of the Ecuadorian economy, with many mining projects still unable to achieve significant levels of mineral production in 2004 (Sutcliffe, 2005; U.S. Energy Information Administration, 2005, p. 5; International Monetary Fund, 2004§,¹ 2005§).

In 2004, exports of crude petroleum accounted for 40% of the total value of Ecuadorian exports and about 33% of Government revenue. Ecuador was the fifth-ranked producer of crude petroleum in South America, and this production accounted for about 20% of the total value of the country's GDP in 2004.

Nonfuel mineral exports accounted for only about 0.2% of the total value of the country's exports. Mine production of metals and industrial minerals, together with the fabrication of mineral products both from metals and industrial minerals, roughly accounted for about 3.3% of the GDP. After petroleum, the country's leading resources were, in order of expected value, fish, shrimp, timber, and gold (International Monetary Fund, 2005§; U.S. Department of State, 2005§; U.S. Energy Information Administration, 2005§).

Government Policies and Programs

In the late 1990s, Ecuador experienced a series of economic crises, including a serious financial crisis that caused the country to default on some of its debt. The country's Government sought and obtained financial assistance from the International Monetary Fund (IMF), which helped stabilize Ecuador's financial situation. Immediately following this financial stabilization, the real GDP grew significantly in 2001, but did not increase substantially again until 2004. As part of its financial stabilization policy in 2000, Ecuador authorized that all transactions could be made in U.S. dollars, which continued to help lower inflation through 2004. Ecuador has implemented many IMF-sponsored reforms to continue receiving IMF assistance, including reductions in the country's social programs and liberalization of domestic energy prices. In 2004, Ecuador's rural poor, including many artisanal miners, shared the costs of higher domestic energy prices and faced the effects of reduced social programs but did not receive much direct economic benefit from the increased value of the country's exports of mineral fuels. The Ecuadorian President was elected in January 2003 with the popular support of poorer voters because he promised to reject the IMF-mandated reforms. In 2004, however, these reforms were promoted instead of rejected. Citing this issue among other conflicting political ideals, the main opposition party in the Ecuadorian Congress claimed popular support and attempted to impeach the President late in the year. The Congress was almost successful and the opposition party expressed confidence in its ability to gain the few remaining votes necessary to impeach the President in 2005 (International Monetary Fund, 2004§, 2005§; U.S. Energy Information Administration, 2005§).

In 2004, the President struggled to find a politically acceptable middle ground in his attempts to reform the mineral fuels sector. His petroleum sector reactivation plan was designed to attract more foreign direct investment (FDI) and involved a reorganization of the state-owned petroleum company *Empresa Estatal Petróleos del Ecuador (PetroEcuador)* to allow private companies (mostly foreign) to operate many oilfields owned by PetroEcuador under new service contracts. The existing hydrocarbons law made these fields essentially inaccessible to foreign investors by allowing PetroEcuador to set terms in its production-sharing contracts with foreign investors

¹References that include a section mark (§) are found in the Internet References Cited section.

that were economically prohibitive. As a result of almost no FDI flowing into maintaining and modernizing the state-run fields, lower Government funding for PetroEcuador because of slower growth in the country's economy, and a small tax base since 2001, annual production at these fields was decreasing through 2004. The President's mineral fuels plan took the form of a new hydrocarbons bill, but Congress rejected the bill. Therefore, PetroEcuador retained complete control over its fields but had insufficient funds to reinvest in maintaining production or in developing new fields on property controlled by the company. The Government also failed to produce any additional financial incentives to encourage private companies to reinvest in their privately owned fields or to conduct more exploration. It also did not take steps to reduce the significant risk of Government expropriation or other political risks faced by foreign petroleum companies in Ecuador (U.S. Energy Information Administration, 2005§).

The hydrocarbons law that was in effect in Ecuador in 2004 was basically the same as the one approved in 1993, but a supplementary provision was added in 1994 to lower the proportion of profits from private mineral fuel production in Ecuador that had to be paid to the Government through production-sharing contracts with PetroEcuador. According to the hydrocarbons law, all subsurface mineral fuel resources belonged to the state, but these production-sharing contracts allowed foreign companies to obtain the rights to explore and exploit certain concessions in the country as long as they share a certain proportion of the profits made from any discoveries that result in commercial production. Effectively, the terms of these production-sharing contracts determined the amount and type of royalty to be paid to PetroEcuador by foreign companies. Private companies were not entitled to even partial reimbursement by PetroEcuador of money invested in exploration and development to get a newly discovered field to the production stage. FDI in exploration and development slowed down considerably more after a provision for more-stringent environmental standards was added to the hydrocarbons law in 1999 (Alexander, 2002, p. 263).

The 2004 hydrocarbons proposal would have made association contracts legal, which would have allowed foreign companies limited access to produce from fields that had already been explored and somewhat exploited by PetroEcuador. Foreign companies believed that these fields would take less initial investment to bring them into production or to significantly increase production levels than would be required to explore and develop completely new fields or significantly expand production at existing private fields (under the terms of the current hydrocarbons law). Also, these PetroEcuador fields would already be accessible via existing pipelines to export any additional crude petroleum to more lucrative markets abroad. In 2004, the economic terms under the existing hydrocarbons law (including the mandated terms of the production-sharing contracts) were regarded by interested investors as less favorable to FDI relative to other global market opportunities and were blamed for limited FDI in the sector during the year. Firms that had already invested in this sector of the mineral industry of Ecuador complained of being plagued by legal uncertainties, burdensome tax policies, and environmental liability concerns

after the 1999 revision of the hydrocarbons law. Historically high oil prices in 2004 were expected to have led to a larger increase in FDI in the mineral fuels sector and in the production of petroleum than actually took place (U.S. Commercial Service, 2005, p. 52; U.S. Energy Information Administration, 2005§).

In 2004, although legal cases brought against foreign oil companies were more prominent in the news, legal challenges by foreign companies to Ecuadorian tax and contract laws also helped to deter foreign firms from investing in new exploration and development of mineral fuel properties or from acquiring any existing private oilfields. Foreign companies were allowed to participate in fuel distribution, refining, and transport activities, but the Ecuadorian Government still controlled domestic mineral fuel prices in 2004. Indigenous activists brought a lawsuit against ChevronTexaco Corporation over the Texaco Petroleum Company's former petroleum operations in Ecuador. The suit was still being tried in the courts at the end of 2004; a ruling against ChevronTexaco would confirm the existence of substantial legal risk for foreign investors. Both EnCana Corporation and Occidental Petroleum Corporation took legal action against the Government regarding missing rebates of the value-added tax (VAT) paid by petroleum exporters other than PetroEcuador. In response, Congress amended the tax laws in 2004 to specifically exempt petroleum exporters from VAT rebates (U.S. Commercial Service, 2005, p. 52; U.S. Energy Information Administration, 2005§).

In 2001, the 1991 mining law was heavily revised to create a new national plan for the development of a national mining sector; this plan was still in effect in 2004. The 2001 revision was aimed at encouraging additional FDI in the mining sector by eliminating Government royalties, reducing the payment of surface rights per hectare, approving mining titles valid for all mining processes for 30 years, and streamlining the concession application and approval processes. The primary goal was to enable foreign investors to have the same access to mining concessions as domestic investors, except that foreigners were still prohibited from obtaining mining rights in zones adjacent to international boundaries without the permission of the President and the approval of the Consejo de Seguridad Nacional (U.S. Commercial Service, 2005, p. 53).

The two main shortrun objectives to be accomplished by implementation of the 2001 revision to the mining law were to double investment in the sector and to substitute domestic production for at least 50% of the country's imports of minerals that were deemed critical for establishing a mineral industry in the country. This mineral security strategy targeted imports of copper, gold, silver, and some industrial minerals. In the medium run, the objectives were to have explored and mapped at least 30% of the most promising mineral deposits in the country, to have created at least three industrial parks for mineral processing and metallurgical production, and to have the nonfuel minerals sector contribute at least 5% of the country's GDP. In 2004, it did not appear that objectives had been met, although no hard timeline was set for obtaining these goals. In 2004, the validity of mining concessions awarded to foreign interests under the newer, more-streamlined process described in the latest revision to the mining law was under review after some

mineral exploration and exploitation licenses to potential mining concessions were unexpectedly canceled by the Ministerio de Energía y Minas (MEM) in 2003 (U.S. Commercial Service, 2005, p. 53; Dirección Nacional de Minería, 2005§)

The principal risks faced by foreign investors in all sectors of the Ecuadorian economy were owing to continuing inconsistencies in enforcement of existing regulations and contractual commitments. Ecuador's judicial system has traditionally exhibited long processing delays and unpredictable judgments in civil and commercial cases, and this tendency continued in 2004. Foreign investors in the mineral industry reported incurring additional costs to find judges who were free from external influence and who would provide a stable and predictable regulatory environment for their investment interests. Contracts had to be carefully scrutinized and judicial enforcement was deemed necessary to assure payments on time and in the amounts previously agreed to. Near the end of 2004, the Ecuadorian Congress attempted to replace the justices of the Supreme Court of Ecuador (U.S. Commercial Service, 2005, p. 7-8, 55).

A substantial risk of expropriation was evident in Ecuador in 2004. The 1997 U.S.-Ecuadorian Bilateral Investment Treaty was in effect in 2004 and was designed to provide foreign companies the same treatment as domestic companies with respect to taxation and property rights; unrestricted remittances and transfers; prompt, adequate, and effective compensation for any expropriations; and binding international arbitration of disputes. This last portion of the treaty was named the Arbitration and Mediation Law. Under this law, a U.S. company won a \$75 million international arbitration award against the Government of Ecuador in 2004. By the end of the year, however, the award still had not been paid. Instead, the Government requested a domestic judicial review of the arbitration award, and Ecuador's Solicitor General initiated an investigation of the company. Citing another provision in the treaty that authorizes expropriation to be legally carried out for a public purpose (such as national security), the Government has since advocated the nullification of the company's contract and seizure of the company's considerable assets in Ecuador (U.S. Commercial Service, 2005, p. 55, 61, 65).

Structure of the Mineral Industry

CIMA principally mined gold (and some other metals as byproducts) in the historic gold district of Portovelo-Zaruma after the South American Development Company halted its mining operations there and left Ecuador in the mid-20th century. CIMA declared bankruptcy in the late-1970s, and its former employees and other miners illegally occupied the company's concessions in Portovelo-Zaruma through 2004. These artisanal miners have been inconsistently supported with some mining equipment, as well as food and other consumable supplies, by numerous private mining companies (mostly foreign) that have acquired and then lost or sold the rights to exploit these concessions. In the 1980s and 1990s, two additional mining districts, Nambija (in the Amazon region) and Ponce Enriquez (on the southwestern slopes of the Andes mountains), were discovered and opened up to artisanal miners,

who increased the technological capability of their mining operations to mine underground and increased recovery rates through the use of cyanidation processes. In 2004, small-scale gold production was still concentrated mainly in primary deposits with underground workings in these three mining districts, where the artisanal miners are mostly organized into cooperatives, but some wider-spread small-scale mining activity primarily aimed at extracting gold from placer or secondary deposits also took place (Sandoval, 2002, p. 3-5).

In 2004, the leading foreign investors in Ecuador were petroleum companies engaged in exploration and production in the Amazon region of eastern Ecuador. These companies were led by, in order of the value of production of crude petroleum in 2004, Occidental of the United States, EnCana of Canada, Repsol YPF S.A. of Spain, Agip Petroleum Ecuador Ltd. (a subsidiary of Agip SpA, Italy), and Perenco PLC (based in London, United Kingdom, and Paris France). Several foreign petroleum distribution companies, which included ChevronTexaco and Exxon Mobil Corp., were also active in Ecuador. The construction of the petroleum pipeline Oleoducto de Crudos Pesados (OCP) was completed during the second half of 2003 by Oleoducto de Crudos Pesados Ltd., which was owned by a consortium that included EnCana (31.4%), Repsol (25.6%), Petróleo Brasileiro S.A. (Petrobrás) of Brazil (15%), Occidental (12.2%), Agip (7.5%), Techint Compañía Técnica Internacional S.A. (a wholly owned subsidiary of the Techint Group of Argentina) (4.1%), and Perenco (4%). This transportation pipeline was primarily responsible for allowing Ecuador to increase petroleum production and exports in 2004 despite a decrease of reinvestment in the upstream production capacity of the sector in 2004. FDI in the mineral fuels sector (both upstream and downstream) dominated total FDI in the mineral industry of Ecuador. Total FDI in the entire mineral industry increased by about 9% in 2004 compared with that of 2003. This followed a decrease of 22% in FDI in the mineral industry in 2003 compared with that of 2002, primarily owing to a dearth of new investment in the mineral fuels sector after completion of the OCP (U.S. Commercial Service, 2005, p. 64-65; Banco Central del Ecuador, 2005§).

In 2004, Ecuador had two main oil pipelines: the OCP and the Sistema Oleoducto Trans-Ecuatoriano (SOTE), which was built in the early 1970s and runs from the northeast corner of the country out to the Pacific coast. In March 2004, a landslide halted transportation of crude petroleum through the SOTE, and PetroEcuador was forced to delay fulfilling some of its export contracts. In 2004, PetroEcuador primarily used the SOTE to export its production of crude petroleum, and private (foreign) companies mostly used the OCP. The OCP mostly parallels the route of the SOTE. Completion of the OCP doubled Ecuador's pipeline capacity. EnCana led a consortium of private companies that operated the OCP. Ecuador also exported crude petroleum through a third pipeline, the Oleoducto Trans-Andino (OTA). The OTA connects Ecuador's fields to the Colombian port of Tumaco (U.S. Energy Information Administration, 2005§).

Ecuador's petroleum fields are located in the Amazon Basin in the northeastern part of the country. In 2004, the most productive field was Eden Yuturi, which was controlled

by Occidental. The other leading fields were, in order of production of petroleum in 2004, Shushufindi (PetroEcuador), Dorine (EnCana), and Sacha (PetroEcuador). The Government announced that it would auction the Ishpingo-Tapococho-Tiputini (ITT) fields as one block in 2005. The ITT fields are also located in Ecuador's Amazon region. Ecuador has three oil refineries with a combined production capacity of 176,000 barrels per day (bbl/d). The leading refinery in Ecuador is the Esmeraldas refinery, which is located on the Pacific coast (U.S. Energy Information Administration, 2005§).

In 2004, investment (including FDI) in metallic and industrial mineral mine production was negligible, although some junior mining investment companies reported increased budgets for mineral exploration in Ecuador during the year. Nonpetroleum FDI was focused on, in order of decreasing levels of foreign investment, the financial services, food processing, chemical, pharmaceutical, and machinery- and vehicle-manufacturing sectors of the Ecuadorian economy. Total FDI inflows amounted to approximately \$1.5 billion (or 5.8% of the GDP) in 2003. U.S.-based companies were the major investors in the Ecuadorian economy, and U.S. FDI in 2004 was mainly focused on petroleum production. U.S. investment also helped increase production of some nonfuel minerals, mostly industrial minerals. Morton International Inc. of the United States produced salt. Holcim Ecuador S.A. (a subsidiary Holcim Ltd. of Switzerland) produced cement and other construction materials. U.S. firms active in Ecuador's manufacturing sector that relied on minerals mined in or imported into Ecuador included Owens Illinois Inc. (glass containers) and Phelps Dodge Corporation (copper and aluminum conductors) (U.S. Commercial Service, 2005, p. 64-65). Some of the industrial mineral raw materials that were used by both Holcim and Owens Illinois, such as sand and limestone, were mined in the Amazon region of Ecuador, but most industrial raw materials were imported into the country, including feldspar and soda ash, which Owens Illinois imported from the United States (Cristalería de Ecuador S.A., 2005§).

Dirección Nacional de Minería (DINAMI), which is the Government agency responsible for managing mining rights, reported that investment in mine production of metals and industrial minerals totaled only about \$6 million in 2003 (the latest year for which data were available). This total did not include the bulk of investment in the sector that went toward exploration, mostly for copper, gold, and silver. Total FDI in mine production and petroleum extraction and transportation in 2003 was about \$828 million, which represented a negligible proportion of the total investment in the mineral industry of Ecuador. Domestic investment accounted for an insignificant proportion of the total investment in either sector. In 2004, the distribution of FDI between the sectors of the mineral industry of Ecuador was estimated to be very similar to that of 2003 (Dirección Nacional de Minería, 2004§; Banco Central del Ecuador, 2005§).

Employment in the mining of metals and industrial minerals reported to DINAMI totaled about 4,122 people in 2003. Official statistics recorded by Ecuador's Instituto Nacional de Estadística y Censos (INEC), however, indicated that the number of people employed in mineral extraction via mining activities was 1,915. The DINAMI number may include

many small-scale miners not included in the INEC figure. DINAMI listed 2,255 of the miners that reported to the agency as mining for gold in the Provinces of Azuay, El Oro, and Zamora Chinchipe. Almost all the rest of the miners included in DINAMI's labor figures were listed as mining industrial minerals in areas scattered throughout the country but somewhat concentrated around the lower slopes of the Andes mountains. INEC listed 6,708 workers as involved in the total production of industrial mineral products, such as construction materials, and 6,829 employed in metallurgy and the production of metal products. The official numbers for these sectors were expected to be closer to the actual number of employees because these sectors include far fewer informally employed workers than does mining. The official employment statistics for the mineral fuels sector are also expected to reflect very closely the actual number of workers employed. INEC listed 1,747 employees involved in the extraction of crude petroleum and 2,705 employed in petroleum refining. An estimate of the number of workers involved in exploration for mineral fuels, industrial minerals, and metals, would have to be compiled from individual company employment records. Total employment in Ecuador was about the same in 2004 as in 2003 and included about 2,251,144 persons employed in rural areas, and 4,220,610 employed in the more urban areas of the country. These figures were listed by INEC and included both formal (registered) and an estimate of informal (unregistered) employees, as well as an estimate of the number of underemployed in Ecuador (Dirección Nacional de Minería, 2004§; Instituto Nacional de Estadística y Censos, 2004§).

Exploration

In 2004, the level of total investment in the petroleum sector was estimated to be about \$903 million, but it is unclear how much of this amount was invested in exploration and development. Public figures were unavailable, but most of the major firms involved in exploration for mineral fuels in Ecuador reported that budgeted expenditures in the country were much lower in 2004 than in 2003 owing to the increased political uncertainty surrounding passage of a new hydrocarbons law. Thus, although the annual average price of petroleum was at a record high level in 2004, investment in exploration and development in Ecuador likely decreased compared with that of 2003 (Dirección Nacional de Minería, 2004§; Banco Central del Ecuador, 2005§).

Nongovernmental organizations (NGOs) have repeatedly obstructed exploration and production activities in the Amazon region of eastern Ecuador, where the proposed developments of the ITT fields are to be located. The ITT fields were estimated to contain 900 million barrels (Mbbl) of proven reserves, with potentially recoverable reserves of possibly as much as 1,300 Mbbl. These new fields reportedly contain extra-heavy crude petroleum, however, so any producer would need to blend it with lighter mineral fuels before transporting it via pipeline to export. Additional production costs could prove to be prohibitive and could result in an unsuccessful auction of the development rights to the ITT fields, which was scheduled for sometime in 2005. The MEM estimated that the exploration and

development of the ITT fields would require a total investment of about \$5 billion (Alexander's Gas & Oil Connections, 2004a§, b§; U.S. Energy Information Administration, 2005§).

In 2004, a number of firms were engaged in nonfuel minerals exploration in Ecuador. Most of these firms were primarily exploring for gold, although some spent significant amounts exploring for other metals (such as copper and silver) and industrial mineral deposits. The primary companies involved in Ecuadorian exploration for metals in 2004 were Aurelian Resources Corp., Bear Creek Mining Corp., Corriente Resources Inc., Dynasty Mining & Minerals Inc., IAMGOLD Corporation, International Minerals Corp., Largo Resources Ltd., Skeena Resources Limited, Sultana del Condor Minera S.A., and TVX Gold Corp. The only companies that reported any measured or indicated resource estimates were Aurelian, which reported measured and indicated resources of about 16,000 kilograms (kg) of gold at its Condor property; Corriente, which reported indicated resources of 1.8 million metric tons (Mt) of copper and about 53,000 kg of gold at its Mirador property; Dynasty, which reported measured and indicated resources of about 13,000 kg of gold and 100,000 kg of silver at its Jerusalem property and indicated resources of about 20,000 kg of gold at its Zaruma property; and International Minerals, which reported measured and indicated resources of 18,400 kg of gold and 140,000 kg of silver at its Río Blanco property. In 2004, the Jerusalem and Mirador projects were at the feasibility stage of drilling, and the Río Blanco project was at the prefeasibility stage (Wilburn, 2005).

In 2004, IAMGOLD announced a budget of \$2.3 million for exploration at its El Mozo and Quimsacocha gold-silver properties. Largo announced a budget of \$1.5 million for exploration in 2004-05 at its Macuchi copper-gold-silver property. In 2004, Corriente reduced its exploration budget for Mirador compared with that of 2003. The company expressed a desire to complete the necessary environmental impact assessment and to attempt to develop Mirador into a producing mine, generate revenue for investing in more exploration to the north of Mirador and at the company's other two properties, Panantza and San Carlos, in the Río Zamora copper porphyry district very near the border with Peru (Corriente Resources Inc., 2005, p. 9). International Minerals budgeted about \$5 million to be spent from October 2003 through April 2005 for two phases of exploration at Río Blanco (International Minerals Corporation, 2003§).

Production

The completion of the OCP pipeline was the most important reason that Ecuador's production of crude petroleum increased sharply in 2004 compared with that of 2003 because petroleum companies no longer had to hold back production that could not be effectively transported to foreign markets through the old SOTE pipeline. In 2004, PetroEcuador controlled about 37% of the country's total production of petroleum. PetroEcuador's annual production of crude petroleum has decreased since at least 2002, and the state-run company has not reinvested much in its aging fields or in exploring for new fields during this time. This has raised the relative importance of the private

(foreign-owned) petroleum companies in Ecuador, which have increased their annual share in the country's production of crude petroleum during the same timeframe (U.S. Energy Information Administration, 2005§).

In 2004, the artisanal production of minerals did not appear very responsive to increases in prices, and medium-scale mining in Ecuador was almost nonexistent. Thus, mine production in the country increased slightly for most metals and industrial minerals produced, but not by as much as in neighboring countries (with a proportionally greater share of production by larger mining companies) in response to similar price increases (table 1).

The International Iron and Steel Institute (IISI) reported that Ecuador produced about 72,000 t of continuously cast crude steel from imports of ferrous raw mineral materials, although the estimated figure at the time of finalization of table 1 for this chapter (October 2005) shows an estimated slight increase in production compared with that of 2003. This lack of response of production to steel prices (which increased by about 34% in 2004) was not owing to a lack of capacity for expansion of production but to increased competition for Ecuador's imports of iron ore and coking coal both globally and in Latin America. In 2004, primary production of crude steel in Ecuador was by one company, Acerías Nacionales del Ecuador S.A. (ANDEC), and secondary production was by a subsidiary of ANDEC, Fundiciones Nacionales S.A. (FUNASA). Together, they form the steel complex Complejo Siderurgico ANDEC-FUNASA in the city of Guayaquil (International Iron and Steel Institute, 2005, p. 11).

Trade

In 2004, about 50% of the crude petroleum that was produced in Ecuador was exported to the United States, and the remaining 50% was exported to countries in South America and Asia. Ecuador still accounted for only about 2.3% of U.S. imports of crude petroleum, which ranked the country a distant second to Venezuela among the countries of South America. Ecuador signed preliminary agreements in late 2004 to import natural gas from Peru. A new natural gas pipeline to link northern Peru with southwestern Ecuador was proposed to fuel powerplants near Guayaquil, but only if new plants could be constructed there or if some of Ecuador's older, diesel-fired powerplants could be converted to burn natural gas. By 2004, Ecuador had succeeded in constructing only one gas-fired powerplant at Machala, however, and financial problems concerning the operators of the conventional, diesel-fired thermal plants in the country continued to deter foreign investment in their conversion (U.S. Energy Information Administration, 2005§).

In 2004, Ecuador was one of South America's leading consumer markets for liquefied petroleum gas (LPG), which was used extensively for residential heating and cooking in the country. Domestic production met only one-quarter of demand for LPG in Ecuador. The country was also a net importer of diesel fuel and naphtha. In 2004, the Government adopted a plan to modernize its refineries and build a fourth refinery to substitute domestic production for imports of refinery products. The Government was also considering converting some of

its old diesel-burning powerplants to hydropower to reduce Ecuador's expenditures on imports of diesel, which became much more expensive in 2004 than in 2003. In 2004, Ecuador imported about 7.2 Mbbbl of LPG, 5.5 Mbbbl of diesel fuel, and 4.6 Mbbbl of naphtha. Ecuador also exported some other refinery products, but these were mostly residual fuel oil and other fuel oils (Dirección Nacional de Hidrocarburos, 2005§; U.S. Energy Information Administration, 2005§).

The Dirección Nacional de Geología (DINAGE) determined that barites, bentonite, cement clinker, hydraulic cement, dolomite, feldspar, natural and roasted gypsum, kaolin, magnesite, quartz, silica sand, and crude and unrefined sulfur were the most important industrial minerals being imported in 2002. In 2004, DINAMI reported that Ecuador produced cement, gypsum, kaolin, silica sand, and sulfur. DINAGE estimated that domestic mineral resources were sufficient to satisfy apparent national consumption of these minerals at the 2001 level into the near future. Expanding and/or beginning new production of these and other strategic minerals was projected to be of lower cost in the long run than that of importing the same quantity of minerals until an unspecified time horizon. Similarly, DINAMI estimated that the amount of copper, gold, and silver mineral resources that existed within Ecuador could allow domestic production of these metals to be more economical than importing them. In 2003, imports of metallic and industrial mineral commodities accounted for about 19% of the total value of Ecuador's imports, and the country's mineral trade balance, including mineral fuels, was about \$938 million. The value of nonfuel mineral exports was only 1.2% of the value of nonfuel mineral imports, however (Dirección Nacional de Geología, 2004§; Dirección Nacional de Minería, 2004§).

In 2004, the trade relationship between Ecuador and the United States was conducted under the framework of unilateral trade preferences of the Andean Trade Preferences Agreement (ATPA), which was set to expire in 2006. This unilateral commercial concession to Ecuador was a major reason why Ecuador's exports to the United States increased by more than 26% from 2001 to 2004, according to U.S. Census foreign trade statistics (U.S. Commercial Service, 2005, p. 56). On May 18, 2004, the United States began free trade negotiations with Colombia, Ecuador, and Peru in the hopes of establishing a multi-lateral U.S.-Andean free trade agreement (FTA) or at least one or more bilateral FTAs. The particular U.S. concerns regarding an FTA with Ecuador include protection of worker rights and efficient resolution of investment disputes, which the U.S. Trade Representative announced that the Ecuadorian Government had taken steps to address (U.S. Trade Representative, 2004a§, b§).

In 2004, Ecuador was also a member of the Andean Community, the Latin American Integration Association, and the World Trade Organization. Ecuador had already concluded bilateral FTAs with Bolivia, Chile, Colombia, the member countries of the Mercado Común del Sur (MERCOSUR), Peru, and Venezuela. Ecuador was also engaged in the Free Trade Area of the Americas negotiations with the United States (U.S. Commercial Service, 2005, p.49). Ecuador has reduced tariffs, eliminated most nontariff surcharges, and enacted an in-bond

processing industry since 1990. The country set most of its tariff rates at 30 percent or less when it joined the World Trade Organization in 1996. In 2004, Ecuador's average applied ad valorem tariff rate was about 11%. In addition to import tariffs, all imports were subject to a 12% VAT and other lesser taxes. Some products reportedly entered Ecuador without companies paying legally required tariffs and taxes, although all imports to and exports from the country may legally be inspected by authorized international verification companies (U.S. Commercial Service, 2005, p.6-7).

Outlook

If crude petroleum prices remain high in 2005, already existing fields will provide the best opportunities to increase production in the short run; modernization of these fields would allow firms to ship more petroleum to destination markets before prices have a chance to decrease. In 2004, however, the existing fields that could benefit most from modernization remained under the control of PetroEcuador, which had insufficient funds to invest in their modernization. Therefore, the major economic activities in the mineral industry of Ecuador are expected to continue to center around the efforts of PetroEcuador to find joint-venture partners and to reactivate some of the marginal petroleum fields under its control. The Government's plans to auction many of these fields to private foreign investors in 2005 may be accomplished if expectations for petroleum prices are high enough to cover for uncertainties concerning future ownership of these fields, uncertainties concerning possible passage of a new hydrocarbons law, and the legal risks inherent in inconsistent enforcement of existing laws. Foreign companies are also expected to continue to face uncertainties concerning taxation, environmental lawsuits, and possible nationalization of their petroleum fields (Petroleum Economist, 2004a, b; Alexander's Gas & Oil Connections, 2004a§, b§).

The President planned to solicit bids by foreign investors to build the proposed Jaramijo Industrial Hydrocarbon complex and modernize the country's aging refineries in 2005. This would help industrialize Ecuador's petroleum sector and lower its dependence on imports by increasing the country's capacity to produce more petroleum refinery products domestically. Following the Government's failure to pass a new hydrocarbons bill and excessive burdens placed on the approval process by the country's legal system, however, the President will attempt to award the project construction contracts personally and to have the MEM approve them directly. This would leave interested companies still facing substantial legal risk and repercussions if Ecuador's courts decide to enforce retroactively any of a multitude of overlapping and potentially contradictory laws after construction is completed (Petroleum Economist, 2004a, b).

The modernization of Ecuador's mining law in 2001 and significantly higher prices in 2004 for most of the minerals targeted for investment promotion by this revision to the law did not result in significantly increased mine production. A few exploration projects that were focused on the expected eventual mining of metals approached more advanced stages in 2004, but the chances of any of them making it through the approval

processes for feasibility and environmental impact assessment before the growth rates in prices for these metals slow down considerably compared with record growth rates during the year is unlikely. Because no new developments in this sector were beyond the feasibility stage, timelines for eventual production from the proposed mines will not become very clear until at least after 2005.

References Cited

- Alexander, F.C., Jr., 2002, A proposal for annotated upstream petroleum regime model form provisions, *in* Office of the Assistant Secretary for Legal Affairs and the Canadian International Development Agency, Legal harmonization in the Americas—Business Transactions, Bijuralism and the OAS: Washington, DC, Organization of American States, p. 217-271.
- Corriente Resources Inc., 2005, Annual report 2004: Vancouver, British Columbia, Canada, Corriente Resources Inc., March 22, 20 p.
- International Iron and Steel Institute, 2005, Steel statistical yearbook 2005: Brussels, Belgium, October, 104 p.
- Petroleum Economist, 2004a, Oil reserves inch open, *Petroleum Economist*, v. 71, no. 2, February, p. 15-16.
- Petroleum Economist, 2004b, Populism redux, *Petroleum Economist*, v. 71, no. 12, December, p. 10-12.
- Sandoval, Fabián, 2002, Small-scale mining in Ecuador: London, United Kingdom, Mining, Minerals, and Sustainable Development Working Paper No. 75, International Institute for Environment and Development, 28 p.
- Sutcliffe, John, 2005, Ecuador, *in* Mining annual review 2005: London, United Kingdom, Mining Communications Ltd., CD-ROM.
- U.S. Commercial Service, 2005, Country commercial guide—Ecuador, Fiscal Year 2005: U.S. Embassy, Quito, Ecuador, April 7, 85 p.
- U.S. Energy Information Administration, 2005, Petroleum marketing monthly: Washington, DC, U.S. Department of Energy, December, 160 p.
- Wilburn, D.R., 2005, Exploration overview: *Mining Engineering*, v. 57, no. 5, May, p. 37-48.

Internet References Cited

- Alexander's Gas & Oil Connections, 2004a (February 9), Ecuador announces heavy crude reserves in Amazon region, accessed September 21, 2004, at URL <http://www.gasandoil.com/goc/discover/dix43845.htm>.
- Alexander's Gas & Oil Connections, 2004b (August 12), Ecuador qualifies sixteen firms for Amazon tender, accessed January 18, 2005, at URL <http://www.gasandoil.com/goc/company/cnl45119.htm>.
- Banco Central del Ecuador, 2005, Inversión directa por rama de actividad económica, accessed December 19, 2005, at URL <http://www.bce.fin.ec/frame.php?CNT=ARB0000938>.
- Cristaloría de Ecuador S.A., 2005, Raw materials, accessed December 20, 2005, at URL http://www.cridesa.com/ingles/acercadelvidrio/materia_prima.asp.
- Dirección Nacional de Geología, 2004, Serie de rocas y minerales industriales, accessed December 19, 2005, at URL <http://www.menergia.gov.ec/secciones/archivos/dinagerocas.pdf>.
- Dirección Nacional de Hidrocarburos, 2005, Estadística Hidrocarburífera 2004, accessed October 28, 2005, at URL <http://www.menergia.gov.ec/secciones/archivos/hidroEstadisticas2004.xls>.
- Dirección Nacional de Minería, 2004, Estadísticas 2003, accessed August 31, 2005, at URL <http://www.menergia.gov.ec/secciones/archivos/dinamiEstadisticas2003.xls>.
- Dirección Nacional de Minería, 2005, Políticas de desarrollo del sector minero nacional, accessed December 19, 2005, at URL <http://www.menergia.gov.ec/secciones/mineria/DinamiPolitic.html>.
- Instituto Nacional de Estadística y Censos, 2004, Personal ocupado y remuneraciones, accessed December 19, 2005, at URL http://www.inec.gov.ec/interna.asp?inc=enc_tabla&idTabla=137.
- International Minerals Corporation, 2003 (October 14), International minerals announces positive scoping studies at Rio Blanco gold-silver project, Ecuador, News Release, accessed December 25, 2005, at URL http://home.globalcrossing.net/~emc/news_releases/pr_03-10-14.html.

- International Monetary Fund, 2004 (August 12), IMF concludes 2004 Article IV consultation with Ecuador, accessed May 5, 2005, at URL <http://www.imf.org/external/np/sec/pn/2004/pn0491.htm>.
- International Monetary Fund, 2005 (September), Ecuador, World Economic Outlook Database, accessed December 16, 2005, via URL <http://www.imf.org/external/pubs/ft/weo/2005/02/data/dbginim.cfm>.
- U.S. Department of State, 2005 (August), Background note, Ecuador, accessed December 16, 2005, at URL <http://www.state.gov/r/pa/ei/bgn/35761.htm>.
- U.S. Energy Information Administration, 2005 (February), Ecuador, Country Analysis Brief, accessed May 5, 2005, at URL <http://www.eia.doe.gov/emeu/cabs/ecuador.html>.
- U.S. Trade Representative, 2004a (May 3), Peru and Ecuador to join with Colombia in May 18-19 launch of FTA negotiations with the United States, accessed December 19, 2005, at URL http://www.ustr.gov/Document_Library/Press_Releases/2004/May/Peru_Ecuador_to_Join_With_Colombia_in_May_18-19_Launch_of_FTA_Negotiations_with_the_United_States.html?ht=ecuador20ecuador.
- U.S. Trade Representative, 2004b (June 4), Zoellick to visit Peru and Ecuador June 7-9, accessed December 19, 2005, at URL http://www.ustr.gov/Document_Library/Press_Releases/2004/June/Zoellick_to_Visit_Peru_Ecuador_June_7_-_9.html?ht=ecuador20ecuador.

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TABLE 1
ECUADOR: PRODUCTION OF MINERAL COMMODITIES¹

(Metric tons unless otherwise specified)

Commodity	2000	2001	2002	2003	2004 ^e	
METALS						
Cadmium, mine output, Cd content ^c	kilograms	200	200	200	200	--
Copper, mine output, Cu content ^c		100	100	100	100	--
Gold, mine output, Au content	kilograms	2,871	3,005	2,750	4,819 ^r	5,300 ²
Iron and steel, steel, crude		58,483	59,732 ^r	68,743 ^r	79,800 ^e	80,000
Lead, mine output, Pb content ^c		200	200	220	220	220
Silver, mine output, Ag content ^c	kilograms	2,000	2,000	96 ²	100	--
Zinc, mine output, Zn content ^c		100	100	100	100	--
INDUSTRIAL MINERALS						
Barite		1,476	1,181	1,180 ^e	2,139 ^r	2,350
Cement, hydraulic	thousand metric tons	2,800	2,920	3,000 ^e	3,100 ^e	3,100
Clays: ³						
Common	do.	325	345	382	340 ^r	374
Kaolin		11,022	703	8,483	11,884 ^r	13,100
Feldspar		47,041	60,688	31,254	44,268 ^r	48,700
Gypsum, crude		1,043	834	4,730	5,200 ^e	5,200
Salt, common ^c		90,000	90,000	90,000	90,000	90,000
Sand:						
Silica, glass sand		27,522	34,718	40,880	38,856 ^r	42,700
Ferruginous ^c		9,950	9,900	9,000	9,000	9,000
Stone, sand and gravel:						
Limestone ³	thousand metric tons	3,147	4,079	6,699	4,688 ^r	5,160
Marble		1,680	1,344	265	1,890 ^r	2,080
Pozzolan		27,687	373,023	519,090	190,747 ^r	190,000
Pumice	thousand metric tons	345	373	130	271 ^r	298
Sand and gravel	thousand cubic meters	2,596	3,414	4,467	3,272 ^r	3,600
Sulfur: ^e						
Native		4,000	4,000	4,000	4,000	4,000
Byproduct:						
From petroleum		11,778 ²	11,700	11,700	11,700	11,700
From natural gas		5,000	5,000	5,000	5,000	5,000
Total		20,800	20,700	20,700	20,700	20,700
Zeolites		1,291	1,801	1,883	-- ^r	--
MINERAL FUELS AND RELATED MATERIALS						
Gas, natural:						
Gross	million cubic meters	1,057	1,001	998	1,039	1,000
Marketed	do.	156	121	93	249 ^r	240 ²
Liquefied natural gasoline	thousand 42-gallon barrels	699	664	603	514	542 ²
Petroleum:						
Crude	do.	146,209	148,746	143,758	153,539 ^r	192,517 ²
Refinery products:						
Liquefied petroleum gas	do.	2,818	2,407	2,060	2,358 ^r	2,411 ²
Gasoline	do.	13,306	12,236	12,887	13,090	9,741 ²
Jet fuel	do.	1,938	1,771	1,797	1,879	2,209 ²
Distillate fuel oil	do.	10,787	10,953	11,354	10,812	13,312 ²
Residual fuel oil	do.	14,079	11,898	10,742	8,879	12,734 ²
Unspecified, including kerosene	do.	13,942	15,786	14,687	13,221	14,278 ²
Total	do.	56,870	55,051	53,527	50,239 ^r	54,685 ²

^eEstimated; estimated data are rounded to no more than three significant digits; may not add to totals shown. ^rRevised. -- Zero.

¹Table includes data available through October 2005.

²Reported figure.

³No reports of separate quantities for limestone or clay used in cement production were received for this table.