

# **2007 Minerals Yearbook**

# CHILE

# THE MINERAL INDUSTRY OF CHILE

### By Steven T. Anderson

In 2007, the Republic of Chile remained the world's leading copper producer and exporter, accounting for 36.5% of the total world mine production of copper. The country was also the world's leading producer of lithium (mostly in the form of lithium carbonate) and rhenium, accounting for about 38% and 46%, respectively, of global mine production. Chile was estimated to be the world's second ranked producer of arsenic (which was produced mostly as a byproduct of copper smelting) and was estimated to have accounted for about 19% of global production. The country was the world's third ranked producer of molybdenum and the fourth ranked producer of refined selenium, accounting for about 22% and 5.4%, respectively, of global production (Brooks, 2008a; Edelstein, 2008; George, 2008b; Magyar, 2008a, b; Ober, 2008a).

Chile ranked fifth in the world in mine production of silver and accounted for about 7% of global mine output. In Chile, production of molybdenum, rhenium, selenium, and silver was either mostly or exclusively a byproduct of copper processing. In 2007, 44% of the country's production of silver was extracted as a byproduct from copper processing. The country also accounted for about 1.7% of the world's mine production of gold, and 36% of this production was as a byproduct of Chilean copper production (table 1; Brooks, 2008b; George, 2008a, b; Magyar, 2008a, b; Servicio Nacional de Geología y Minería, 2008, p. 22, 60-62, 67).

Chile's globally significant production of industrial minerals was highly dependent on mining of the brines and caliche ores contained in the salars of the country. The salars of Chile have been estimated to contain the largest natural reserves of nitrates in the world, although the quantities of nitrates and specialty fertilizers produced in 2007 were only of regional significance. Chile's production of lithium was based on mining the country's salars, as was the country's production of iodine. Chile was the leading producer of iodine in the world and accounted for about 62% of global production; about 60% of identified global reserves of iodine were located in Chile. The country was the second ranked producer of mined boron (ulexite) and the third ranked producer of pumicite (mostly in the form of pozzolan) in the world. Chile accounted for about 11% and 9%, respectively, of the world's mine production of boron and pumicite. Chile was estimated to have accounted for 2.7% of global production of phosphate rock (P<sub>2</sub>O<sub>5</sub> content), 2.4% of salt (NaCl), between 1% and 2% of both diatomite and potash (K<sub>2</sub>O content), and about 1.5% of global production of sulfur, mostly in the form of sulfuric acid obtained as a byproduct of metallurgical processes in the country (table 1; Bolen, 2008; Dolley, 2008; Jasinski, 2008; Kostick, 2008a, b; Ober, 2008b, c; Virta, 2008).

In summary, Chile's position in the world mineral economy was as a leading supplier of many raw minerals, ores, and concentrates, especially those containing metals associated with the mining of copper and industrial minerals (including lithium carbonate) associated with mining the salars in the country. About 63% of the copper content of the country's mine output of ores and concentrates was further processed domestically to produce refined copper, and Chile accounted for about 16% of the world's production of refined copper, ranking second only to China. The country's recent economic development had increased demand for electricity, and Chile had difficulty acquiring adequate supplies of mineral fuels to run the country's powerplants. Costs of mineral fuels and electricity increased accordingly, and installing additional refining capacity (for production of refined copper or other refined mineral products) was not considered as profitable as continuing to ship ores and concentrates to be refined abroad, including export of about 75% of the copper concentrates produced in Chile (Harris, 2006; Comisión Chilena del Cobre, 2008, p. 120-121, 124-125).

#### Minerals in the National Economy

In 2007, total mine production accounted for about 22% (\$35.8 billion<sup>1</sup>) of the country's gross domestic product (GDP). Of this total, copper mine production was valued at about \$32.7 billion and accounted for 20% of the country's GDP. The total value of copper exports (total copper contained in exported ores, concentrates, primary metal, and scrap) was valued at about \$38 billion. This accounted for about 86% of the total value of all mining exports (\$44 billion) and about 65% of the total value of all Chilean exports during the year. The annual average price of refined copper on the London Metals Exchange (LME) rose to about \$7.13 per kilogram (\$3.23 per pound) compared with \$6.73 per kilogram (\$3.05 per pound) in 2006 and about \$3.68 per kilogram (\$1.67 per pound) in 2005. In 2007, the annual average price of most of the metallic minerals produced in Chile was at or very near its highest level since 1990, including that of copper, gold, lead, molybdenum, silver, and zinc. The same could be claimed for many of the industrial minerals produced in Chile since 1998, including iodine, lithium carbonate, and potash. In real<sup>2</sup> terms, the value of mine production of copper increased by 3.54% compared with that of 2006, and that of all noncopper mine production increased by 4.17%; the value of total mine production in Chile increased by about 3.65% during the same timeframe (Banco Central de Chile, 2008a, p. 30-31, 34; Comisión Chilena del Cobre, 2008, p. 27, 69, 134-139; International Monetary Fund, 2008b).

The mineral trade balance of Chile was \$30.1 billion (including crude petroleum and natural gas) compared with a revised balance of \$27.1 billion in 2006. Imports of mineral fuels (\$11.33 billion) accounted for 74.2% of the value of the country's total mineral imports compared with 72.2% (\$8.37 billion) in 2006. The value of imported mineral fuels accounted for about 24% of the total value of all goods imported

<sup>&</sup>lt;sup>1</sup>Where necessary, nominal values have been converted from Chilean pesos (Ch\$) to U.S. dollars (US\$) at an annual average exchange rate of Ch\$522.47=US\$1.00 for 2007. All values are nominal, at current 2007 prices, unless otherwise stated.

<sup>&</sup>lt;sup>2</sup>Real values are adjusted for inflation using constant 2003 prices.

by Chile compared with 22% in 2006. In 2007, Chile spent \$9.74 billion on imports of petroleum and petroleum refinery products; about \$1.4 billion of this amount was spent on imports of crude petroleum from Brazil (the leading supplier). Of the \$5.26 billion Chile spent on imports of refinery products, \$3.5 billion was spent on imported diesel fuel oil; of this amount, \$1.7 billion was spent on imports of diesel from the Republic of Korea (the leading supplier), and about \$1.3 billion was spent on diesel from the United States. Chile spent \$1,126 million on imports of natural gas compared with \$889 million in 2006. In both years, essentially all imports of natural gas (in a gaseous state) were supplied by Argentina (Banco Central de Chile, 2008b, p. 31, 61, 64, 80-81, 103, 120, 124, 144, 213).

In 2007, copper mining operations directly accounted for 6.2% of the country's total consumption of mineral fuels. In addition, copper mining and processing operations also accounted for 32.2% of total electricity consumption in Chile, and about 80% of the electricity used by these mining operations was generated at mineral fuel-burning powerplants (mostly natural gas). This was primarily because the country's leading copper mines were located in the northern part of the country and obtained their electricity from the Sistema Interconectado del Norte Grande (SING) grid, which was entirely supplied by plants that burned mineral fuels. Most of the country, including the largest metropolitan centers, was supplied by the Sistema Interconectado Central (SIC) grid, which used about 50% mineral fuels and 50% hydropower to generate electricity. In both grids, existing capacity to generate electricity by burning both coal and diesel was substituted for gas-fired capacity because Argentina reduced the supply of natural gas to Chile (at lower prices relative to those of diesel and coal) during the year. On the SIC grid, the ability to substitute additional hydropower for burning more expensive mineral fuels was severely limited owing to low water reservoir levels in Chile (Vidal, 2007a, p. 3-6; Vargas and others, 2008).

In a study that surveyed approximately 99% of the production of copper cathodes in Chile in 2007, Comisión Chilena del Cobre (COCHILCO) estimated that 1 metric ton (t) of electrowon (hydrometallurgical process) copper cathodes in Chile was produced with an average of about 20,000 megajoules (MJ) of energy, and it required slightly more than 25,000 MJ to produce the same amount of electrorefined cathodes (including the energy required to produce the necessary anodes). The unit cost (in US\$) of the electrorefining process was closer to that of electrowinning compared with the respective unit costs in 2006, because the cost of generating sufficient electricity for electrowinning increased relative to the cost of the mixture of energy inputs required to produce the same amount of cathodes using the electrorefining process. To help reduce uncertainty in the provision of sufficient electricity for mining and mineral processing operations, at least four major mining companies considered private projects to supplement electricity provision and evaluated ways to financially support GasAtacama S.A., which was a major electricity provider on the SING grid and a natural gas distributor in northern Chile (Reuters Group PLC, 2007b; Hunt and Contreras, 2008, p. 4-5).

On average, labor costs (per amount of mineral commodity produced) in the mineral industry of Chile increased during

2007. The total wage bill for all mining and the extraction of crude petroleum in the country increased to \$1.9 billion compared with about \$1.7 billion in 2006. This increase did not include nonwage compensation (including bonuses, education, and health-care and housing benefits), which was estimated to also have increased substantially as a result of new labor contracts signed in 2006 and a scarcity of skilled mining workers in the country. In the copper sector, mining companies paid \$300 in wages per metric ton of fine copper produced compared with about \$285 in 2006. Although the annual salary per worker in the copper sector decreased to \$36,255 compared with \$38,389 in 2006, 45,839 people were employed in this sector in 2007 compared with 39,850 during the previous year. Mining and the extraction of crude petroleum employed about 58,320 people compared with 51,430 in 2006, of which the metallic minerals sector employed 50,743 compared with 44,682 in 2006. The most notable increase in salary in the metallic minerals sector was with respect to the production of iron ore; the annual salary per worker increased to \$25,304 compared with \$22,334 in 2006. The industrial minerals sector employed 5,526 compared with 5,037 in 2006. In the mineral fuels sector, petroleum extraction employed 1,354 and coal mining, 696, compared with 1,066 and 645, respectively, in 2006. In addition to these official employment figures, a study of mining in northern Chile found that each job directly involved with mining generated approximately 7 additional jobs associated with that single mining worker (table 1; Economist, The, 2006, 2007; Jordan, 2007; Servicio Nacional de Geología y Minería, 2007, p. 17-20; 2008, p. 17-20).

In addition to higher labor and energy expenditures, mining companies also faced substantially higher costs for equipment and supplies (tires, for example), and water. Mining companies were estimated to account for about 70% of all water consumption in northern Chile, where Minera Escondida Ltda. invested in construction of a desalinization plant to process seawater about 240 kilometers away from the Escondida Mine. The Government suggested that mining companies in this arid region of Chile consider other costly investment in technologies to reduce leaks and evaporation, recycle, and otherwise use water more efficiently. The costs of obtaining or retaining rights to existing freshwater sources were also increasing as scarcity led to increased competition among mining companies, and between mining companies and other nonmining interests in the region (Blackburn, 2007; Business News Americas Ltda., 2007b).

Preliminary figures indicate that actualized foreign direct investment (FDI) in the mining sector decreased to about \$314 million compared with \$1,120 million in 2006. The total level of FDI authorized by the Government for the mining sector in 2007 was about \$1,070 million, but only about 29% of the pre-authorized level was actually implemented by foreign investors during the year. Public investment in mining, including investment by the state-owned copper mining company Corporación Nacional del Cobre (CODELCO), increased to \$1.6 billion compared with about \$1.2 billion in 2006, but actualized total investment in mining in the country still decreased to about \$1.9 billion compared with about \$2.4 billion during the same timeframe (Comisión Chilena del Cobre, 2008, p. 70-71).

#### **Government Policies and Programs**

On June 16, 2005, the Government approved Law 20.026 to establish a mining-specific tax (royalty), which modified both the applicable Mining Code (approved on September 26, 1983) and the 1974 foreign investment statute, known as Decree Law 600 (D.L. 600). The new tax, which is assessed on a per-company basis, took effect at the beginning of 2006 and applies only if the total value of mine production by a single company exceeds the average value of 12,000 t of copper during the year. Before passage of the new mining-specific tax law, the most recent significant modifications of the Mining Code had been through approval of a Mining Safety Act on December 30, 2002. The main environmental law was Decree Law 19.300, which was approved on March 9, 1994, but this law was supplemented on December 7, 2002, by approval of Decreto Supremo 95, a Government decree that requires environmental impact statements (EISs), for any new investment projects that involve either exploration for or extraction of the country's natural resources. Decreto Supremo 95 is the primary statute for environmental regulation of mining concessions in Chile (Rojas and others, 2006, p. 360-362; Comisión Chilena del Cobre, undated).

In 2006, the Government passed the Fiscal Responsibility Law (FRL) that created two funds to manage increased revenues from mining royalty payments combined with increased revenues from CODELCO. In 2007, the annual average price of copper increased by about 6%, and Chile's mine production of copper increased by about 3.7% compared with levels in 2006. The FRL extended the commitment of the Government to a structural fiscal surplus rule that was established in 2000 to help insulate the economy from fluctuations in mineral commodity prices. During a boom period (as during 2007), this rule allows the Government to spend only the portion of the surplus revenue that is considered permanent and to save the transitory portion. As part of the FRL, a panel of six members was selected to form a financial advisory council to advise the Minister of Finance concerning investment guidelines and other matters related to the two funds, including helping to determine what portion of the surplus mining revenues was permanent and what portion was transitory. (Transitory Government surpluses from the copper sector have been termed, "copper windfall revenues.") The first fund is called the Economic and Social Stabilization Fund (ESSF) and was established with an initial investment of about \$6 billion in 2006, mostly from the closure of the old Copper Stabilization Fund (established in 1985); the second fund is called the Pension Reserve Fund and was established with an initial investment of \$600 million. By the end of 2007, these funds contained about \$14 billion and \$1.5 billion in assets, respectively. The International Monetary Fund recommended that the Government develop a long-term domestic (re)investment plan for the funds (which were foreignheld), but recognized that such a plan would be problematic without an accurate evaluation of Chile's total copper wealth (table 1; Davis, 2007; International Monetary Fund, 2007, p. 42-44; 2008a, p. 1, 4-5, 13-15, 60-61).

The Chilean Government, through the Ministerio de Minería, exercises control of the mineral industry through

three state-owned companies and four regulatory agencies. The state-owned companies that are important to the mineral industry include CODELCO, some subsidiaries of Corporación de Fomento de la Producción (CORFO), and Empresa Nacional de Minería (ENAMI). The specific subsidiaries of CORFO that are important to the mineral industry include Cía. Chilena de Electricidad S.A., Empresa Nacional del Carbón S.A. (ENACAR), and Empresa Nacional del Petróleo S.A. (ENAP). The four regulatory agencies are Comité de Inversiones Extranjeras (CIE), COCHILCO, the Comisión Nacional del Medio Ambiente (CONAMA), and the Servicio Nacional de Geología y Minería (SERNAGEOMIN).

Since energy shortages in 1998 and 1999, the Government reportedly had revised regulations concerning electricity generation and transmission, water rights, electricity distribution, and competition in the electrical power sector. In 2007, the regional branch of CONAMA in the Antofagasta Region (Region II) rejected the EIS of Minera Escondida for a project to extract subterranean waters from aquifers in the Pampa Colorada area. In May 2005, Law 20.017 was approved to amend the Chilean Water Code. Law 20.017 included legal measures that were designed to limit extraction of water to no more than 5% from nonrenewable sources, possibly including some of the aquifers in Region II where there is insufficient rainfall to renew them. In 2007, however, the Dirección General de Aguas (the national water regulator) allowed CODELCO to continue with construction of the company's Gaby copper mine, reportedly under a development plan for the project that would result in the extraction of water from the Elvira and Los Morros subterranean aquifers in another arid area of Region II (Industrial Info Resources Inc., 2007; Metal Bulletin, 2007a; Business News Americas Ltda., 2008a).

In response to the shortages of electricity and other energy shortages in 2007, ENAP commissioned a terminal to import liquefied natural gas (LNG) at the Port of Quintero in central Chile, and CODELCO was considering financing the construction of another one at the Port of Mejillones in northern Chile, possibly as a 50% joint venture with SUEZ-Tractebel S.A. of France. ENAP's foreign subsidiary ENAP Sipetrol also planned to invest in restarting oil and gas production in the Cuenca Austral area offshore southern Argentina. The Government's Free Competition Tribunal (TDLC) approved construction of five hydroelectric plants by the country's two leading electricity distributors in Chile's southern Aysen region, but the electricity companies still faced a bidding process for the necessary water rights and were required to submit an EIS to CONAMA. CONAMA approved an EIS for a plant to convert municipal solid waste into fuel in Santiago, and was considering an EIS for construction of a wind farm in Region IV (Alexander's Gas & Oil Connections, 2007; Petroleum Economist, 2007; Reuters Group PLC, 2007a; Business News Americas Ltda., 2008b; Business Wire Inc., 2008).

#### Production

In 2007, mine production of copper in Chile did not increase by as much as expected compared with that of 2006, primarily owing to a strike by contract workers and lower grades at state-owned CODELCO mines, and to technical problems at the privately owned Collahuasi Mine. As late as July 2007, COCHILCO projected that Chile would produce about 5.7 million metric tons (Mt) of fine copper by the end of the year, but only about 5.56 Mt ended up being produced. With respect to other metals, mine production of lead and silver and estimated plant production of rhenium increased substantially; the production of manganese decreased substantially compared with production levels in 2006. According to SERNAGEOMIN, the increase in lead production was apparently owing to increased production at El Toqui Mine. The increase in silver production was primarily owing to the opening of the Puren pit at La Coipa Mine, which contained about twice the silver grade in ore compared with the Coipa pit. (The Coipa pit was the primary source of ore in 2006 at La Coipa Mine, but not in 2007.) The increase in rhenium production was owing to an expansion of Molibdenos y Metales S.A. (MOLYMET)'s Nos plant in 2007. The reason for the decrease in production of manganese was not apparent at the time of this writing, and Chile produced less than 1% of the world's mine production of manganese in 2007 (table 1; Metal Bulletin, 2007b; Servicio Nacional de Geología y Minería, 2007, p. 65; 2008, p. 14, 71; Vidal, 2007b; Anglo American plc, 2008, p. 41; Corathers, 2008; Corporación Nacional del Cobre, 2008, p. 2-4, 15; Kinross Gold Corp., 2008, p. 37; Xstrata plc, 2008, p. 70).

For 2005 and 2006, SERNAGEOMIN reported zero bentonite production (used mostly to bind fish meal into pellets or balls in Chile), but production in Chile was again reported for 2007. S.L.M. Mabel Dos Primera de Arica in the Arica Region was the only producer of bentonite listed by SERNAGEOMIN. Production of barite (used mostly as an ingredient in paints in Chile) decreased substantially, although production of feldspar (mainly for manufacturing of ceramics and glass, but also used as a component in paints in Chile) increased significantly. Production of kaolin (used primarily in the manufacture of white ceramics for sanitary uses and as an additive in paper in Chile) almost doubled compared with that of 2006. Beginning in 2004, officially listed production of kaolin was recorded by SERNAGEOMIN separately from that of bauxitic or refractory clays. The domestic construction sector continued to expand, which increased demand and helped to encourage increased production of ornamental dimension stone (especially travertine), although production of lapis lazuli decreased substantially. Production of silica in the country increased substantially, primarily in response to domestic demand from the metallurgical sector and also to supply glass manufacturers in the country. An increase in foreign demand was cited as being the primary factor in encouraging increased production of lithium compounds, nitrates, and ulexite (a boron material). Increased production of lithium in Chile appears to have been primarily owing to a plant expansion by Sociedad Chilena de Litio Ltda. Sulfatos del Norte S.A., Celite Chile Ltda. (a subsidiary of IMERYS S.A. of France), and Bifox Ltda. appear to have increased production of copper sulfate, diatomite, and phosphorite, respectively, although further information was unavailable. There also was no information available at the time of this writing concerning the substantial decreases in production of dolomite, pozzolan, and zeolites in Chile (tables 1, 2; Moores,

2007; Servicio Nacional de Geología y Minería, 2008, p. 7, 14-16, 77, 81-83, 91-92, 94-96, 100-103, 106-117, 122).

In 2007, production of most mineral fuels decreased substantially compared with levels of production in 2006. This was mostly owing to decreasing reserves of coal, natural gas, and petroleum in Chile. Also, production of methanol decreased substantially primarily owing to decreased imports of natural gas from Argentina compared with those in 2006 (table 1; Empresa Nacional del Petróleo, 2008, p. 23, 64, 126; Methanex Corp., 2008, p. 2, 5; Servicio Nacional de Geología y Minería, 2008, p. 14, 123).

#### **Structure of the Mineral Industry**

By the beginning of 2007, many of the world's leading private mining companies, which included Anglo American plc and Antofagasta plc of the United Kingdom, Barrick Gold Corp. of Canada, BHP Billiton Ltd. and BHP Billiton plc of Australia and the United Kingdom (BHP Billiton), Goldcorp Inc. of Canada, Phelps Dodge Corp. of the United States, Rio Tinto Ltd. and Rio Tinto plc of Australia and the United Kingdom (Rio Tinto), and Xstrata plc of Switzerland, were deeply invested in the mining sector of Chile. During 2007, the continuing global wave of mergers and acquisitions in the mining sector resulted in other major mining companies joining this list, including Freeport-McMoRan Copper & Gold Inc. of the United States (through its merger with Phelps Dodge Corp. in March) and Teck Cominco Ltd. of Canada (through its acquisition of Aur Resources Inc. of Canada in August). Additionally, Kinross Gold Corp. became the owner of the leading gold and silver mine in Chile after acquiring Goldcorp's share of La Coipa Mine in December. In October 2007, another change of ownership of smaller-scale gold and silver mines in Chile occurred when Yamana Gold Inc. of Canada acquired Meridian Gold Inc. of Canada (table 2; Freeport-McMoRan Copper & Gold Inc., 2008, p. 5; Kinross Gold Corp., 2008, p. 2, 10, 36; Teck Cominco Ltd., 2008, p. 18; Yamana Gold Inc., 2008, p. 45).

BHP Billiton held a controlling ownership interest (57.5%) in the Escondida Mine, and Rio Tinto held a minority interest (30%). In terms of fine copper content of annual mine production, Escondida was the largest single mine in the world and accounted for 9.56% of global copper production. During 2007, production was ramped up at the sulfide-leach plant at Escondida; the total designed capacity of the Escondida Mine was 3.2 million metric tons per year (Mt/yr) of copper concentrates (with an estimated average grade of approximately 35% fine copper) and 330,000 metric tons per year (t/yr) of copper cathodes. Thus, the estimated designed capacity was about 1.45 Mt/yr of fine copper, although actual production at Escondida was 1.484 Mt of copper in 2007. BHP Billiton also continued to ramp up production at the company's wholly owned Spence Mine and produced about 130,000 t of copper cathodes there, which was still below the designed capacity of 200,000 t/yr (table 2; BHP Billiton Ltd., 2008, p. 28-29; Comisión Chilena del Cobre, 2008, p. 17, 120; Minera Escondida Ltda., 2008, p. 7, 13)

The leading Chilean-owned companies in the mineral industry were CAP S.A., CODELCO, MOLYMET, and Sociedad

Química y Minera de Chile S.A. (SQM); CAP, MOLYMET and SQM were privately owned. In 1987, the privatization of partially state-owned Compañía de Acero del Pacífico S.A. was completed to form CAP, which controlled most of the production of ferrous metals in the country. By the end of 2007, CAP's wholly owned subsidiary Compañía Siderúrgica Huachipato S.A. (CSH) had expanded capacity to produce 1.45 Mt/yr of crude steel (starting in 2008) compared with about 1.1 Mt/yr in 2006. During 2007, the production capacity of CSH was estimated to be about 1.2 Mt/yr of crude steel. State-run CODELCO was the leading copper mining company in the world and accounted for 10.7% of global production of fine copper. Although it was not clear if there were any reductions in listed copper production capacity, CODELCO produced a total of 1.665 Mt of fine copper in 2007 compared with 1.783 Mt in 2006 and 1.831 Mt in 2005. By the end of 2007, MOLYMET had expanded its roasting capacity by about 20,000 t/yr of molybdenum contained in concentrates at its Nos plant and was estimated to be able to produce an additional 15,000 t/yr of molybdenum oxide (from which other intermediate products, such as ferromolybdenum, are produced) and an additional 7 t/yr of rhenium recovered as a byproduct. For 2007, the estimated rhenium production capacity listed in table 2 was increased to 24.5 t/yr, and this amount is expected to increase to about 31 t/yr in 2008 after the capacity expansion at the Nos plant is completed. SQM continued to be the world leader in the production of iodine, lithium carbonate (not contained in spodumene), and specialty fertilizers (based on natural nitrates). The company expanded its production capacity of specialty fertilizers by completing construction of a new prilling and granulating facility at its Coya Sur plant in 2007 (table 2; Metal Bulletin, 2007b; CAP S.A., 2008, p. 3, 7; Comisión Chilena del Cobre, 2008, p. 17, 120; Corporación Nacional del Cobre, 2008, p. 11, 24-25; Molibdenos y Metales S.A., 2008, p. 5, 25-27; Sociedad Química y Minera de Chile S.A., 2008, p. 13, 16-18, 59-60).

#### **Mineral Trade**

Ranked by decreasing value, the top three metals exported by Chile in 2007 were fine copper (\$37,900 million); combined molybdenum contained in ferromolybdenum, molybdenum oxide and trioxide, and molybdenum concentrate (\$4,060 million); and gold (\$580 million). Exports of these metals accounted for about 56%, 6%, and 1%, respectively, of the total value of all Chilean exports. In tonnage, molybdenum exports increased by 10% (to about 69,000 t) compared with that of 2006, copper exports increased by 8.4% (to about 5.7 Mt), and gold exports decreased by 7% (to about 26 t). Silver-export tonnage increased the most (by about 60%) compared with that of 2006 and reached a level of slightly greater than 1 Mt in 2007; exports of iron ore increased substantially (by about 15%) to 6.7 Mt (Fe content) (Comisión Chilena del Cobre, 2008, p. 27-28).

In terms of value, China was the leading destination for Chilean mineral exports followed by Japan and the United States, and this ranking was almost entirely determined by the value of each country's copper imports from Chile. During 2007, China accounted for 17.2% (\$7.6 billion) of the total value of Chile's mining sector exports (metals and industrial minerals only), of which Chile's exports of fine copper to China were valued at about \$7.5 billion; Japan, 12.7% (\$5.6 billion), of which about \$5.5 billion was attributable to copper imports from Chile; and the United States, 9.4% (\$4.2 billion), of which \$4.0 billion was accounted for by copper. The leading importer of Chile's exports of ferromolybdenum was the Netherlands (37%); of gold, the United States (54%); iron ore, China (40%); molybdenum concentrates, the Netherlands (45%); molybdenum oxide, Japan (46%); silver, Mexico (28%); and zinc, the Republic of Korea (21%). In 2007, Mexico was the new leading destination for Chile's silver exports (the United States was the leading destination in 2006), and the Republic of Korea was the new leading destination for zinc exports, replacing Japan. For the other leading metallic mineral exports of Chile, the leading export destinations remained the same as in 2006 (Comisión Chilena del Cobre, 2008, p. 29-31).

Chile's leading exports of industrial minerals were, in order of decreasing value in 2007, iodine (\$324 million), lithium carbonate (\$186 million), and combined (potassium and sodium) nitrates (\$82 million). The value of the iodine exports accounted for about 0.5% of the total value of all the country's exports. The leading destinations for iodine exports were the United States (32% of the total value of Chile's iodine exports), Bulgaria (20%), and China (15%); for exports of lithium carbonate, the leading destinations were Japan (35% of the total value of Chile's exports of lithium carbonate), Belgium (15%), and the United States (14%); and for exports of nitrates, the leading destinations were Brazil (42% of the total value of Chile's exports of nitrates), the United States (16%), and Mexico (7%) (Comisión Chilena del Cobre, 2008, p. 27, 30-31).

By region, the countries of Asia accounted for 48.9% of the total value of Chile's exports of metallic minerals (compared with 42.6% in 2006); Europe, 27.5% (33.7%); the Western Hemisphere, 19.2% (22%); and other countries, including Australia and South Africa most prominently, the remainder. The substantial decrease in the European share was mostly owing to the Netherlands spending about \$350 million less on imports of metals from Chile, whereas China spent about \$3.2 billion more. Combined, the countries of the Western Hemisphere were the leading purchasers of Chilean exports of industrial minerals, with a 45.8% share (compared with a 43.6% share in 2006); Asia, 29.6% (19%); Europe, 23.6% (16.5%); and other countries, the remainder. The increase in the Asian share was mostly the result of the value of lithium carbonate exports increasing to account for 27.8% of the total value of Chile's exports of industrial minerals compared with 14.6% in 2006; and the increase in expenditures on imports of lithium carbonate from Chile of about \$28 million and \$10 million by Japan and the Republic of Korea, respectively, in 2007 (Comisión Chilena del Cobre, 2007, p. 30-31; 2008, p. 30-31).

Chile manufactured limited types of construction and mining equipment, and imported a majority of the equipment used in these sectors. In 2007, U.S.-manufactured equipment accounted for about one-third of the equipment used in these two sectors combined, and the United States was the leading mining equipment supplier to Chile. U.S. manufacturers of mining equipment have been able to take advantage of freer exports into the Chilean market since the United States-Chile Free Trade Agreement went into effect on January 1, 2004. On March 27, 2007, Chile signed a bilateral free-trade agreement with Japan, which went into effect on September 1, and a preferential trade agreement with India, which went into effect on August 17. During 2007, Komatsu Ltd. of Japan was a growing supplier of construction and mining equipment to Chile (U.S. Commercial Service, 2009, p. 22-23, 30-31, 50; Dirección General de Relaciones Económicas Internacionales, undated; Komatsu Cummins Chile S.A., undated).

The most important trade issue in the mineral fuels sector for Chile concerned establishing a more secure flow of imports of natural gas. Chile imported approximately 2.4 billion cubic meters of dry natural gas in 2007 compared with about 5.56 billion cubic meters in 2006 and about 6.23 billion cubic meters in 2005. After negotiations failed concerning many intercontinental integration proposals, including proposals for dry natural gas pipelines that would eventually reach the country from natural gas producers in Bolivia, Peru, and Venezuela, Chile resorted to plans for importing LNG. Even in the case of importing LNG, it appeared as if Chile would not be able to secure future supplies from potential producers in South America. Through the end of 2007, only Peru appeared to be making real progress with actual construction of a terminal to liquefy and export natural gas, but the country planned to export almost all LNG to Mexico, with possibly some proportion being exported directly to the United States. Chile agreed to secure supplies of LNG for its planned regasification terminal in Quintero Bay through BG Group plc, and the company had long-term LNG purchase agreements with suppliers located in Egypt, Equatorial Guinea, and Nigeria (BG Group plc, 2007; Petroleum Economist, 2007; Cauclanis, 2008; U.S. Energy Information Administration, 2008).

#### **Commodity Review**

#### Metals

Copper.—CODELCO's total production of fine copper was 1.665 Mt compared with 1.783 Mt in 2006 and 1.831 Mt in 2005. Starting in July 2007, a segment of the contract labor force at CODELCO went on a strike that lasted 37 days. The company associated a loss of about 30,000 t of fine copper production as a result of the labor strike. Also during 2007, there were some technical problems in the CODELCO Norte Division, including a fire in an electric substation and an excavator breakdown, which resulted in production of less copper ore than expected. The CODELCO Norte Division produced 896,308 t of fine copper compared with 940,613 t in 2006, but all mining divisions of CODELCO produced less copper at least partially owing to lower copper grades in the ore. (Production of molybdenum as a byproduct out of the same ore actually increased in 2007.) Partially in response to lower copper grades at existing mines, CODELCO increased investment in development projects to \$1,064 million compared with \$316 million in 2006. These projects included, in order of expected implementation, the Teniente Development Plan, which included the Beneficiation (Plant) Capacity Expansion

Project (completed in 2007) and the Pilar Norte (mining) project (which was expected to start up in mid-2009); the Gabriela Mistral (Gaby) project to construct a new mine and solvent-extraction/electrowinning (SX-EW) plant to produce about 150,000 t/yr of copper cathodes (Gaby was expected to achieve full production by the beginning of 2009); the Andina Phase I Development Project to expand production of fine copper by about a combined 78,000 t/yr from the Rio Blanco and the Sur Sur Mines (phase I was expected to be completed sometime in 2010) (table 2; Corporación Nacional del Cobre, 2007, p. 37; 2008, p. 11, 40-42, 52, 56: Vidal, 2008a).

In 2007, Minera Escondida increased copper production (Cu content) to 1.5 Mt of fine copper contained in concentrates and cathodes compared with about 1.3 Mt in 2006. This increase was mostly owing to the end of labor disruptions in 2006 and to a full year of production from the company's new bioleaching facility and SX-EW plant (commissioned in June 2006). The plant was designed to produce 180,000 t/yr of cathodes from previously stockpiled low-grade copper sulfide ore, and full production was expected to be achieved by sometime in 2008. The low-grade ore was located in run-of-mine (ROM) heaps and piles, and a project to expand the ROM heaps of low-grade ore was started in 2007 to provide enough material for the new plant as it ramped up production. BHP Billiton's Spence copper mine and SX-EW plant began production in December 2006. The Spence plant has a designed production capacity of about 200,000 t/yr of copper cathodes, and full production was expected to be achieved sometime during the second half of 2008 (BHP Billiton Ltd., 2008, p. 28-30; Minera Escondida Ltda., 2008, p. 5, 13-16, 21, 54).

In terms of copper production at an individual mine in 2007, the Collahuasi Mine ranked third in Chile (after the Escondida Mine and CODELCO's Chuquicamata Mine). Beginning sometime in January 2007, a shutdown of a mill to fix a motor caused a 46-day stoppage of a crushing line at Collahuasi. This disruption was estimated to have caused an attributable production loss of about 21,000 t of fine copper, and, in April, COCHILCO reportedly still expected that Collahuasi might produce only about 433,000 t of fine copper during 2007. However, the mine ended up producing about 452,000 t compared with 440,000 t in 2006. In addition, there was a strike among contract workers at Collahuasi (similar to that at CODELCO), but it only lasted about 4 days and didn't appear to have much effect on the annual level of copper production. A debottlenecking project at Collahuasi was expected to expand production capacity by about 30,000 t/yr of fine copper by 2009. Anglo American and Xstrata each owned 44% of Collahuasi and were considering a project to expand production capacity at Collahuasi to 650,000 t/yr of fine copper by sometime in 2010. In November 2007, CONAMA approved an EIS for a development project at Anglo American's wholly owned Los Bronces Mine, and the company began construction to increase production capacity to 400,000 t/yr of fine copper and 5,400 t/yr of molybdenum by 2011 (Walsh, 2007; Anglo American plc, 2008, p. 8, 16, 20-21, 41-42, 159; Xstrata plc, 2008, p. 68-70, 72-73).

During 2007, international copper market circumstances (such as low foreign tariffs, if any, on imports of copper concentrates into many countries that produce copper cathodes at lower cost than in Chile and are closer to the major end-use markets for refined copper than Chile is) did not change enough to lead any companies to plan on constructing any new copper smelters in the country. CODELCO did not plan to reactivate plans for the company's potential project to construct a smelter and refinery complex at the Port of Mejillones, near Antofagasta. This was despite a 3.66% increase (to about 5.56 Mt) in the level of mine output of copper compared with that of 2006, and a projected increase to about 6.63 Mt/yr of mine production of fine copper by 2012. It would require between 4 and 5 years to complete construction of the Mejillones complex, according to plans that were approved in 2003 (Ingeniero Andino, 2003; Harris, 2006; Vidal, 2007b).

At 2006 prices, Chile's real unit production cost for copper cathode was estimated to be \$2.29 per kilogram in 2007 compared with \$2.20 per kilogram during 2006. In 2007, the country's unit production cost for copper cathode was significantly higher than the average for the Latin America region as a whole (\$2.12 per kilogram) and even higher than the average for North America (\$2.19), but was lower than the regional averages for Asia (\$2.36), Eastern Europe (members of the Commonwealth of Independent States plus any other former members of the Council for Mutual Economic Assistance, as of 1990) (\$2.42), Western Europe (\$2.48), Oceania (\$2.92), and Africa (\$3.10). Latin America was also the lowest-cost region in the world in 2006 (\$2.10 per kilogram), followed by North America (\$2.29), Eastern Europe (\$2.39), Western Europe (\$2.41), Oceania (\$3.13), and Africa (\$3.41) (Comisión Chilena del Cobre, 2008, p. 151).

**Gold and Silver.**—In 2007, about 63% [26,112 kilograms (kg)] of Chile's mine output of gold was produced by mines that mined principally for gold, about 36% (14,967 kg) was produced as a byproduct at copper mines in the country, and the remainder was produced as a byproduct of lead, silver, and zinc mines. Also, 55.74% (about 1,080,000 kg) of Chile's mine output of silver was produced as a byproduct by gold mines; 44.07% (853,500 kg) by copper mines; and most of the remainder as a byproduct of lead and zinc mines. Only 173 kg of silver (and about 2 kg of gold) was produced by mines that were considered to produce silver predominantly (Comisión Chilena del Cobre, 2008, p. 21, 23).

By the end of February, Kinross completed its integration of Bema Gold Corp.'s properties, including acquiring a 100% interest in the Maricunga Mine (named El Refugio Mine, up to 2007), which was the leading individual gold mine in Chile in 2007 (produced about 7,500 kg of gold). In December, Kinross acquired Goldcorp's 50% interest in La Coipa Mine, which was estimated to have produced about 465,000 kg of silver and 3,200 kg of gold during the year. Kinross already owned the other 50% of La Coipa Mine, so the company ended the year as the only owner of the leading individual gold mine and silver-producing mine in 2007. The Cerro Bayo Mine was owned by Coeur d'Alene Mines Corp. of Canada and produced about 53,000 kg of silver and 1,166 kg of gold compared with 72,000 kg and 1,273 kg, respectively, in 2006. Production at Cerro Bayo decreased owing to the company mining narrower vein systems, which resulted in both lower metal grades in the ore and less tonnage of ore processed at the mine, but the company expected to mine wider, more productive veins at

Cerro Bayo in 2008 (Coeur d'Alene Mines Corp., 2008, p. 23; Kinross Gold Corp., 2008, p. 36-37, 42-43).

As a result of its acquisition of Bema, Kinross also acquired a 49% interest in the Cerro Casale copper and gold project. Near the end of 2007, Barrick Gold Corp. acquired Arizona Star Resource Corp., including the remaining 51% ownership interest in Cerro Casale. Barrick expected to complete a prefeasibility study of Cerro Casale by about mid-2009. Through the end of 2007, Barrick continued to wait for completion of cross-border agreements with the Governments of Argentina and Chile and approval of mining permits for the company's Pascua-Lama gold and silver project. In 2006, Barrick received approval of Pascua-Lama from CONAMA and approval of the company's environmental permit submission by the Government of Argentina. In 2007, Barrick received approval from the Government of Chile for a wind farm project (10 turbines) to be constructed by the company near Pascua-Lama (Barrick Gold Corp., 2008, p. 10, 12, 15, 27, 40, 44, 107; Kinross Gold Corp., 2008, p. 2-3, 30).

Iron and Steel.-In 2007, another subsidiary of CAP, Compañía Minera del Pacífico S.A. (CMP), produced about 7.9 Mt gross weight of marketable iron ore (concentrate, fines, lumps, pellets, and pellets feed) and accounted for about 89% of the total gross weight of marketable iron ore produced in Chile compared with about 7.7 Mt (still about the same percentage of national production) in 2006. The increased production was almost entirely owing to increased production at CMP's El Algarrobo Mine and the startup of production at the company's new Cristales Mine in Region III. CAP continued construction on phase I of its Hierro Atacama project in the Copiapo Valley in Region II. This project was expected to produce about 3 Mt/yr of pellet feed from the magnetite-rich tailings of the Candelaria copper mine and to export all of it through the port at Punta Totoralillo, which is located north of Caldera. In 2007, 21% of CMP's total production of iron ore was retained for use within the country compared with about 22% in both 2006 and 2005. Of the approximately 6.6 Mt of marketable iron ore exported by CMP and Compañía Minera Huasco S.A. (50% owned by CMP) during 2007, about 45.3% was shipped to China, 25.4% to Japan, 14.8% to Indonesia, 8.2% to Malaysia, 4.3% to the United States, 1.1% to Australia, and the remainder to Peru (tables 1, 2; CAP S.A., 2008, p. 21-24; Compañía Minera del Pacífico S.A., 2008, p. 3, 17-18, 22, 24).

Lead and Zinc.—In 2007, Breakwater Resources Ltd. produced 32,191 t of zinc contained in concentrate compared with 31,725 t in 2006 at the company's El Toqui Mine, because the company mined proportionally more ore from the Concordia deposit owing to ground control problems at the Aserradero deposit. (Concordia contained higher zinc grades in the ore than Aserradero.) Full production out of the Aserradero deposit was expected to resume in 2008, and the higher level of extraction out of Concordia was also expected to continue. During the first quarter of 2008, Breakwater also expected to complete expansion of the lead circuit at El Toqui, so both lead and zinc production at the mine were expected to continue to increase in 2008. In 2007, El Toqui Mine was the leading producer of lead and zinc in the country. About 4,849 kg of silver and 1,151 kg of gold were also produced at the mine compared with 2,230 kg and 1,144 kg, respectively, in 2006 (Breakwater Resources Ltd., 2008, p. 17-18; Servicio Nacional de Geología y Minería, 2008, p. 71-73).

Molybdenum and Rhenium.--Mine production of molybdenum in Chile was entirely as a byproduct of copper mining and processing. Although mine production of molybdenum decreased to 2,525 t in the Andina Division of CODELCO and 1,214 t in the company's Salvador Division compared with 3,308 t and 1,366 t, respectively, in 2006, CODELCO increased total company production to 27,857 t of fine molybdenum compared with 27,203 t. In 2006, the CODELCO Norte Division produced 11,821 t of molybdenum contained in concentrates and 7,244 t of molybdenum contained in oxides compared with 10,583 t and 7,197 t, respectively, in 2006. The CODELCO Norte Division accounted for all of the production of molybdenum oxide listed in table 1, because MOLYMET was only a processor (including of concentrates that originated in foreign countries) and reliable figures concerning other potential production of molybdenum oxide were not available. Los Pelambres Mine was the leading privately owned producer of molybdenum (ranked second in the country after CODELCO), and Minera Los Pelambres S.A. increased production to 10,156 t compared with 9,847 t in 2006. Minera Doña Inés de Collahuasi SCM continued to expand production to 4,039 t of molybdenum contained in concentrate compared with 3,362 t in 2006 (table 1; Comisión Chilena del Cobre, 2008, p. 19; Olivares, 2008, p. 11, 17).

MOLYMET accounted for all the rhenium produced in the country and continued to increase capacity to be able to roast an estimated 45,000 t/yr of molybdenum contained in concentrate at the company's Nos plant by the end of 2007 compared with about 24,600 t/yr at the end of 2006. By the end of 2008, MOLYMET planned to expand roasting capacity at Nos to about 65,000 t/yr of molybdenum, but any associated increase in the company's production of rhenium was expected to be less than proportional to the increase in molybdenum roasting capacity. By the end of the first quarter of 2011, MOLYMET expected to complete a new plant in Mejillones with a roasting capacity of 16,000 t/yr of molybdenum, but information concerning any plans for a rhenium-recovery circuit at this new plant was not available. Annually, some undisclosed proportion of MOLYMET's production of molybdenum products and rhenium in Chile originates from imports of concentrate into the country. In 2007, both Antofagasta (owner of 60% of Los Pelambres Mine) and CODELCO exported molybdenum concentrate directly and also supplied concentrate to MOLYMET to be processed in Chile. CODELCO owned and operated a molybdenum roasting facility at the company's Chuquicamata Mine, but it uninstalled the circuit to recover rhenium from the flue dust at this plant in 1986 (Metal Bulletin, 2007b; Molibdenos y Metales S.A., 2008, p. 5, 25-27; Olivares, 2008, p. 11, 18).

#### **Industrial Minerals**

**Boron and Lithium.**—SQM produced just slightly less than 30,000 t of lithium carbonate in 2007 compared with about 29,000 t in 2006. Reliable data concerning production by Soc.

Chilena del Litio Ltda. (a subsidiary of Chemetall GmbH, which was wholly owned by Rockwood Holdings Inc.) was not available, but the company was estimated to have increased production of lithium carbonate by about 4,000 t compared with that of 2006. SQM was continuing to expand the capacity of the company's plant near the City of Antofagasta to produce 40,000 t/yr of lithium carbonate by the second half of 2008 compared with about 30,000 t/yr in 2007. SQM also increased production of potassium chloride (used to manufacture potash) to 611,000 t compared with 539,000 t in 2006; but decreased production of boric acid to about 7,000 t compared with about 8,000 t in 2006, and decreased production of potassium sulfate (also used to manufacture potash) to 157,000 t compared with 170,000 t (table 1; Sociedad Química y Minera de Chile S.A., 2008, p. 12-13, 20, 38).

Boron products, such as boric acid and ulexite, and lithium carbonate are produced mostly from brines extracted from underground deposits in a salt-encrusted depression called the Atacama Salar, which is located within the Atacama Desert in northern Chile. These brines contain reserves of boron, lithium, potassium, and sulfates, which were processed to produce various industrial mineral commodities that included boric acid, lithium carbonate, lithium hydroxide, potassium chloride, and potassium sulfate. Most of the boron was left in its natural form, as ulexite, and then used in the production of specialty fertilizers rather than processed to produce boric acid. Although Chile has other salars, most of the country's production of these minerals comes from the Atacama Salar. Boron that was left as ulexite, however, was mined mostly from another salar called the Salar de Ascotan and then processed in a boron processing facility located at the Salar del Carmen, which was nearer to the company's lithium processing facilities and the city of Antofagasta. The Atacama Salar is located about 250 km east of Antofagasta (Sociedad Química y Minera de Chile S.A., 2008, p. 14, 19-20, 26-27, 38, 41-43).

Iodine, Nitrogen, and Sodium Sulfate.—SQM produced 8,100 t of iodine compared with 9,800 t in 2006 and decreased the company's total production of crystallized nitrates to 847,000 t compared with 958,000 t. Reliable data for SQM's production of sodium sulfate were not available, although the company mentioned that some production of sodium sulfate may have been included in its line of "Other Products." Therefore, the estimates in table 1 for production of sodium sulfate in 2006 and 2007 are based on the assumptions of almost no production by SQM and only minimal production by small-scale operations in the area around Antofagasta. The company did consider plans to construct a new potassium nitrate plant at the Coya Sur complex, but construction was not expected to begin until sometime in 2008 (with possible completion in 2010), if approved. Once completed, the new plant would increase the company's production capacity to about 950,000 t/yr of potassium nitrate compared with 650,000 t/yr in 2007. Atacama Minerals Corp. produced 1,075 t of iodine compared with 891 t in 2006 at the company's Aguas Blancas Mine, but this increase was less than expected owing to poor weather conditions and a minor earthquake in November 2007. The company began construction of an agitated leach plant, which was expected to help Atacama Minerals increase its

production capacity to 1,500 t/yr of iodine out of the caliche ore mined at Aguas Blancas. The company's targeted time for completion of the plant was sometime in May 2008 (table 1; Atacama Minerals Corp., 2008, p. 1-4; Servicio Nacional de Geología y Minería, 2008, p. 118; Sociedad Química y Minera de Chile S.A., 2008, p. 12-13; 18, 38, 55).

In Chile, iodine, nitrates, and sodium sulfate are produced mostly from open pit mining of the caliche ore deposits that are located in northern Chile. These deposits are typically only 0.5 to 1.5 meters below the surface. SQM produced sodium nitrate at plants located at both the María Elena and the Pedro de Valdivia Mines, although most of the company's capacity to produce potassium nitrate and sodium sulfate was through different processes at the separate Coya Sur plant. SQM produced iodine at plants located at the company's Nueva Victoria and Pedro de Valdivia Mines from ores mined at these two mines and at SQM's two other caliche ore mines, María Elena and Pampa Blanca. In 2007, Atacama Minerals was also working on a feasibility study for a project to produce nitrates from material left over from iodine production out of the caliche ore at the company's Aguas Blancas Mine (Atacama Minerals Corp., 2008, p. 1-4; Servicio Nacional de Geología y Minería, 2008, p. 103, 118, 121; Sociedad Química y Minera de Chile S.A., 2008, p. 14-19).

#### Mineral Fuels

Coal.—In response to higher prices and increased domestic demand following decreases in supplies of other energy sources in 2007, ENACAR kept at least one of its coal mines in the Biobio region (Region VIII) open. However, domestic supplies of coal were still far below estimated demand in Chile. Production of coal in the Biobio region increased to about 184,000 t compared with about 98,700 t in 2006. In 2005 and 2006, the Bish Mine in the Magallanes region (Region XII) was by far the leading producer of coal in Chile, but only about 104,000 t of coal was produced in the Magallanes region in 2007 compared with 575,000 t in 2006 as Bish appeared to be in the process of shutting down. BHP Billiton appeared interested in acquiring concessions to explore for coal in the Magallanes region, and was already conducting exploration as part of the company's Estancia Invierno coal project on the island of Isla Riesco in Magallanes. Isla Riesco reportedly contains more than 1 billion metric tons of subbituminous coal. It appeared as if CORFO was managing all of the auctions for the rights to coal exploration and exploitation concessions in Magallanes (La Prensa Austral, undated; Business News Americas Ltda. 2007a; Servicio Nacional de Geología y Minería, 2008, p. 7, 14-15, 20, 52, 123-124).

**Natural Gas and Petroleum.**—In 2007, all production of crude petroleum and natural gas in Chile was by state-owned ENAP, and the company produced about 930,900 barrels (bbl) of petroleum and 2,015 million cubic meters of natural gas, domestically, compared with 1,061,100 bbl and 2,199 million cubic meters, respectively, in 2006. In 2007, ENAP imported 83.15 million barrels (Mbbl) of crude petroleum to be refined into products for domestic consumption, in addition to importing about 29.84 Mbbl of already-refined petroleum

products. Thus, Chile's production of crude petroleum accounted for approximately 1% of domestic consumption. ENAP's international subsidiary Sipetrol did secure supplies of crude petroleum for Chile by producing abroad, including about 3.6 Mbbl of attributable production in Argentina, 1.6 Mbbl in Ecuador, and about 451,000 bbl in Egypt (Empresa Nacional del Petróleo, 2008, p. 73, 75, 77, 92-94; Servicio Nacional de Geología y Minería, 2008, p. 125-126).

Relative to domestic consumption, domestic production of natural gas was much more substantial than that of crude petroleum. In 2007, exploration concessions for natural gas in Chile attracted many foreign private investors. In October, the Government awarded the Otway Block to Total S.A. of France; the Tranquilo Block to a consortium that included IPR North America Holdings Corp. of the United States and Manas Petroleum Corp. of Switzerland; the Lenga and Russfin Blocks to Apache Corp. of Houston, Texas; the Brotula, the Caupolican, the Isla Magdelena, and the Porvenir Blocks to Greymouth Petroleum Holdings Ltd. of New Zealand; and the Coiron Block to Pan American Energy LLC of Argentina. All these exploration blocks are located in the Magallanes region and are onshore, except for the Brotula and the Isla Magdelena Blocks, which are offshore, and the Otway Block, which is split between onshore and offshore. ENAP holds a 50% nonoperating ownership interest in the Caupolican, the Coiron, and the Lenga Blocks, but no ownership interest in the remaining blocks. Additionally, the Quintero regasification terminal was expected to begin supplying natural gas to the Chilean market in the second quarter of 2009 (Crooks, 2008; Empresa Nacional del Petróleo, 2008, p. 11, 47, 73, 77, 144, 176).

About 98.7% of the crude petroleum used by ENAP in the production of petroleum refinery products was imported, and ENAP's total production of refinery products could account for about 68.5% of domestic consumption. ENAP exported about 11.2 Mbbl of the company's total production of petroleum refinery products, so only about 71 Mbbl of the company's domestic production was consumed domestically (accounting for about 59% of consumption). ENAP's total production of petroleum refinery products decreased by about 7% compared with that of 2006 mostly owing to a scheduled stoppage for maintenance and improvements at the company's Aconcagua refinery. Chile's consumption of petroleum refinery products totaled about 120 Mbbl compared with about 92 Mbbl in 2006 mostly owing to increased use of diesel fuel oil in place of natural gas to generate electricity (as a result of the curtailment of supplies of natural gas from Argentina). In addition, part of the increase in demand for petroleum refinery products was expected as a result of the ongoing process of economic development in the country. Diesel fuel consumption was about 59.6 Mbbl compared with about 39.2 Mbbl in 2006 (Empresa Nacional del Petróleo, 2008, p. 36, 39-41, 92-94).

#### **Reserves and Resources**

In 2007, almost all the reserves and identified resources of copper in Chile were concentrated in Regions I, II, III, IV, V, VI, and XIII (around Santiago), and most of those of gold were in Regions II, III, IV, V, XI, and XIII. According to U.S. Geological Survey Mineral Commodity Summaries 2008, copper reserves in Chile accounted for about 30% of global reserves of copper, although SERNAGEOMIN estimated reserves in Chile to account for slightly less than 40%. This discrepancy may be owing to differences between the two Government agencies concerning the definitions of reserve types. According to either estimate, Chile contained the leading share of reserves of copper in the world. Virtually all the molybdenum, rhenium, and selenium reserves in Chile are associated with the copper deposits. The country hosts the largest share of global reserves of molybdenum (table 3; Edelstein, 2008; Servicio Nacional de Geología y Minería, 2008, p. 54, 61; U.S. Geological Survey, 2008).

Reserves of boron, lithium, potash, and sulfate are found primarily in the salars of northern Chile (closer to the Andes mountain range); reserves of iodine and nitrates are also primarily found in the deserts of northern Chile but in the caliche ore, further east of the Andes. Of these industrial minerals, Chile hosts the largest share of global reserves of iodine and lithium in the world. Considering only proven reserves in the Atacama Salar brines, SQM's proven reserves of boron were about 1.2 Mt in 2007, which was the same level as in 2006; the company's reserves of lithium increased substantially to 3 Mt compared with 2.1 Mt in 2006; company reserves of potassium increased to 49.9 Mt compared with 39.9 Mt; and those of sulfate remained about the same at 36.1 Mt. In 2007, SQM increased its combined proven reserves of nitrates contained in caliche ore to about 41.55 Mt in 2007 compared with about 41.32 Mt in 2006 (Servicio Nacional de Geología y Minería, 2008, p. 91-99, 103, 121; Sociedad Química y Minera de Chile S.A., 2008, p. 39-40).

#### Outlook

According to the Fraser Institute's annual survey (an opinion poll of mining companies and mining consultants), the mining sector in Chile was considered the 6th ranked destination in the world for investment by mining companies by the beginning of 2008 compared with being ranked 27th at the beginning of 2007. This improvement in ranking was probably owing mostly to the resolution of labor issues (especially at Escondida Mine) that restricted production in 2006, and possibly owing to the resolution of lingering political uncertainty surrounding implementation of the new mining-specific tax (first implemented in 2006). Despite Chile regaining much of its status as a destination for foreign mining investment (the country was ranked fourth at the beginning of 2006) and record prices for almost all the mined commodities of which Chile was a significant global supplier, FDI in the mining sector decreased to about \$314 million compared with \$1,120 million in 2006. In the part of the Fraser Institute's survey where mining companies ranked Chile's mineralogical potential-assuming that all 68 global jurisdictions (potential investment destinations) have implemented no land-use restrictions and have the same "best practices" governance over the mining sector—Chile was ranked 31st at the beginning of 2008 compared with 17th at the beginning of 2007 and 11th at the beginning of 2006. Thus, FDI in the mining sector may have

decreased so substantially owing to a perception among mining companies that the mineralogical potential of the country was decreasing, and it also could have been owing to greater uncertainty concerning future prices after record mineral prices were obtained in 2007 (following a rapid fourfold increase since 2003 in the case of the copper price). In 2007, public sector (Government) investment in mining in Chile accounted for about 84% (about \$1,630 million) of the total investment that was realized in the mining sector during the year, so state-run mining companies (such as CODELCO) and joint ventures may continue to be responsible for most of any increases in mine production that take place during the next 5 years. During 2007, higher costs (including for labor) and uncertainty in the supplies of both energy and water were strong deterrents to investment because consideration of these issues may have dampened expectations of future profits from any mining development projects (Comisión Chilena del Cobre, 2008, p. 70-71, 134-139; McMahon and Vidler, 2008, p. 5, 9, 11-12, 18-19, 21, 25, 30).

By the end of 2007, many private mining companies had not established reliable timelines for many of the largest mining projects to reach production, because these projects had not yet completed the prefeasibility stage or were not yet approved by the Government (including for environmental reasons). Exceptions may be SQM's projects to expand of the company's capacity to produce lithium carbonate by mid-2008 and build a new potassium nitrate production facility by sometime in 2010; CAP's Hierro de Atacama project (phase I) to increase production of iron ore, which was expected to be completed by the end of 2008; Anglo American and Xstrata's debottlenecking project to increase copper production at the Collahuasi Mine, which was expected to be completed sometime in 2009; Anglo American's project to expand production of copper and molybdenum at Los Bronces Mine, which was expected to be completed by 2011; MOLYMET's expansion of its Nos plant to increase its capacity to produce molybdenum products and rhenium, and construction of the company's new plant in Mejillones (to produce molybdenum products only), which were expected to be completed by 2009 and sometime in 2011, respectively; Breakwater's addition of a lead circuit and extension of El Toqui Mine into the Concordia south deposit, which were expected to increase the mine's production of both gold and lead upon completion in 2008; and Teck Cominco's Esperanza copper mine project (with significant expected production of gold and silver as byproducts), which was expected to enter production by 2015. Completion of at least some of these projects, however, remain dependent on continued high prices for the commodities expected to be produced (Vidal, 2008b).

If sufficient technological developments for more costeffective mining are forthcoming (for example, CODELCO expected to be producing about 100,000 t/yr of fine copper from bioleaching by sometime between 2011 to 2014) or reductions of mining costs take place in other areas of the mine production chain, then Chile's extensive reserves of many globally important minerals may again attract increased private and foreign direct investment. With respect to copper mining, the greatest increases in production are expected to come from state-run CODELCO, including from the company's new Gaby copper mine, which is expected to be completed sometime in 2009; expansion of the Andina Mine (phase I), which is expected to be completed by the end of 2009; and the Pilar Norte copper project at El Teniente Mine, which is also expected to start production by sometime in 2009. It is unclear, however, if completion of these projects would still leave CODELCO's copper production capacity below the level of 2004, enable it to regain that historic level, or actually expand copper production capacity beyond the company's estimated 2004 level (Corporación Nacional del Cobre, 2008, p. 38-42; Vidal, 2008a, b).

The most pressing mineral industrial issue will continue to be the establishment of a secure supply of mineral fuels (especially natural gas) into Chile to help continue economic development in the country. The outlook for a substantial domestic discovery or development of additional mineral fuels production capacity or for establishing a network of pipelines to import sufficient quantities of natural gas from other countries in South America does not appear very likely for the next 4 to 5 years. Imports of liquefied natural gas are expected to account for a larger proportion of Chile's consumption of mineral fuels starting in 2009 and continuing until at least 2012 (Empresa Nacional del Petróleo, 2008, p. 7, 11, 47, 175-176).

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# TABLE 1 CHILE: PRODUCTION OF MINERAL COMMODITIES<sup>1</sup>

#### (Metric tons unless otherwise specified)

Commodity <sup>2</sup>		2003	2004	2005	2006	2007
METALS						
Arsenic trioxide <sup>e, 3</sup>		450 <sup>r</sup>	500 r	100 r	<sup>r</sup>	
Copper:		4.004	5 412	5 221	5 2 ( 1	<i></i>
Mine output, Cu content <sup>4</sup> Metal:	thousand metric tons	4,904	5,413	5,321	5,361	5,557
Smelter, primary	do.	1,542	1,518	1,558	1,565	1,514
Refined:						
Electrowon	do.	1,653	1,636	1,585	1,692	1,832
Primary, other	do.	1,249	1,201	1,239	1,119	1,105
Total	do.	2,902	2,837	2,824	2,811	2,937
Gold, mine output, Au content	kilograms	38,954	39,986	40,447	42,100	41,527
ron and steel:						
Ore and concentrate:						
Gross weight	thousand metric tons	8,011	8,004	7,862	8,629	8,818
Fe content	do.	4,865	4,850	4,707	5,235	5,379
Metal:						
Pig iron	do.	988	1,137	1,074	1,115 <sup>r</sup>	1,135
Ferromolybdenum <sup>e, 3</sup>		4,070	5,760	9,250	14,000	14,800
Steel, crude	thousand metric tons	1,377	1,579	1,537	1,627	1,666
Semimanufactures	do.	1,197	1,356	1,293	1,520 <sup>r</sup>	1,500
Lead, mine output, Pb content		1,697	2,286	878	672	1,305
Manganese ore and concentrate:						
Gross weight		19,641	25,801	39,786	37,169	26,808
Mn content		5,824	7,188	12,324	9,771	7,287
Molybdenum, mine output, Mo content		33,374	41,883	48,041	43,278	44,912
Of which, oxides <sup>5</sup>		5,398	8,339	8,971	7,197	7,244
Rhenium, mine output, Re content <sup>e, 6</sup>	kilograms	16,000	18,900	21,500	19,800 <sup>r</sup>	22,900
Selenium <sup>e</sup>	do.	83,000	82,000	84,000	74,000	70,000
Silver:						
Mine output, Ag content		1,313	1,360	1,400	1,607	1,936
Metal, Ag content <sup>7</sup>	kilograms	185,375	158,678	171,445	150,952	141,071
Zinc, mine output, Zn content		33,051	27,635	28,841	36,238	36,453
INDUSTRIAL MINERAL	S					
Barite		229	31	91	375	77
Boron compounds:						
Boric acid (H <sub>3</sub> BO <sub>3</sub> )		8,690	8,545	8,774	8,446	7,143
Ulexite, natural		400,603	594,191	460,683	459,645	527,929
Total		409,293	602,736	469,457	468,091	535,072
Cement, hydraulic	thousand metric tons	3,622	3,798	3,999	4,112	4,440
Clays:						
Bentonite		748	101			533
Kaolin		9,000	7,133	15,183	44,642	87,901
Refractory <sup>8</sup>		NA	44,636	35,271	34,594	24,434
Other, including ball and plastic clays		51,622	50,250	54,301	84,846	73,807
Total		61,370	102,120	104,755	164,082	186,675
Copper sulfate		NA <sup>r</sup>	5,871	9,659	5,124	10,217
Diatomite <sup>9</sup>		15,775 <sup>r</sup>	24,131 <sup>r</sup>	16,418 <sup>r</sup>	19,104 <sup>r</sup>	25,405
Dolomite		17,308	27,436	24,903	24,006	13,791
Feldspar		6,690	4,838	5,820	5,847 <sup>r</sup>	6,704
Gypsum:						
Crude	thousand metric tons	662	630	661	845	773
Calcined	do.	190	304	310	197	200
odine, elemental		15,580	14,931	15,346	16,494	15,473
Lime, hydraulic <sup>e</sup>	thousand metric tons	480 <sup>r</sup>	540 <sup>r</sup>	600 <sup>r</sup>	660 <sup>r</sup>	700

#### TABLE 1—Continued CHILE: PRODUCTION OF MINERAL COMMODITIES<sup>1</sup>

#### (Metric tons unless otherwise specified)

Commodity <sup>2</sup>		2003	2004	2005	2006	2007
INDUSTRIAL MINERALS	S—Continued					
Lithium compounds, natural:						
Lithium carbonate		41,667	43,971	43,595	50,035	55,452
Lithium chloride			494	681	1,166	4,185
Nitrates, crude, natural	thousand metric tons	1,134	1,402	1,283	1,112	1,160
Phosphate rock (apatite):						
Gross weight		9,389	11,695	10,311	12,236	12,910
$P_2O_5$ content		2,894	3,604	3,178	3,770 °	3,980 °
Phosphorite		11,911	9,770	10,052	1,600	12,163
Potash, natural:		11,911	2,110	10,052	1,000	12,105
Potassium chloride, KCl		764,065	742,709	733,814	647,449	690,692
Of which, $K_2O$ equivalent <sup>10</sup>		482,700	469,200	463,600	409,000	436,300
Potassium sulfate, $K_2SO_4$		157,174	177,325	162,102	170,406	155,853
Of which, $K_2O$ equivalent <sup>e,11</sup>		80,000	90,000	83,000	87,000	79,000
Pozzolan, including pumice	thousand metric tons	1,242	1,535	1,620	1,423	1,136
Pyrophyllite	thousand metric tons	3,534	2,271	3,315	1,425	1,150
Salt (NaCl)	thousand metric tons	6,213	4,939	6,068	4,580 <sup>r</sup>	4,404
	thousand metric tons	0,215	4,939	0,008	4,380	4,404
Siliceous sand and gravel (silica):		129	450	590	444	520
Quartz, common	do.	428	453	589	444	520
Silica sand	do	487	632	562	638	713
Total	do.	916	1,085	1,151	1,082	1,234
Sodium compounds, n.e.s., sulfate <sup>12, 13</sup>		44,011	30,622	15,730	100 e	100 <sup>e</sup>
Stone:		5 005	6.516	( 702	7 1 4 5	7.106
Limestone, calcium carbonate	thousand metric tons	5,905	6,516	6,783	7,145	7,196
Of which:		170	105	215	220	202
Coquina		179	195	215	330	392
Ground calcium carbonate, white		20	25	41	16	15
Lapis lazuli		129	43	130	400	72
Marble		828	845	31	169	204
Travertine		<sup>e</sup>	e	4,680	12,020	14,805
Sulfur, byproduct <sup>14</sup>	thousand metric tons	1,463 <sup>r</sup>	1,508	1,659 <sup>r</sup>	1,664 <sup>r</sup>	1,573
Talc		840	722	886	704	764
Zeolites			203	298	280	140
MINERAL FUELS AND RELAT						
Coal, bituminous and lignite, marketable	thousand metric tons	347	238	732	674	288
Coke, coke oven <sup>e</sup>	do.	470	540	530	560	570
Methanol	do.	2,704	2,692	3,029	3,186	1,841
Natural gas liquids: <sup>e</sup>						
Natural gasoline	thousand 42-gallon barrels	1,000	1,000	1,000	1,000	1,000
Liquefied natural gas	do.	2,500	2,500	2,500	2,500	2,500
Total	do.	3,500	3,500	3,500	3,500	3,500
Natural gas, marketable	million cubic meters	2,181	2,106	2,294	2,199	2,015
Petroleum:						
Crude and condensate <sup>15</sup>	do.	1,319	1,292	1,208	1,061	931
Refinery products: <sup>16</sup>						
Liquefied petroleum gas	do.	7,534	7,793	7,101	8,623	8,246
Gasoline, including for aviation	do.	19,809	20,861	19,767	21,668	18,720
Kerosene, including for jet fuel	do.	5,322	6,042	5,564	5,548	4,862
Diesel and distillate fuel oil	do.	30,297	27,658	26,282	25,600	24,040
Residual fuel oil	do.	12,332	13,581	15,421	17,523	16,310
Other, including asphalt, ethylene, nap	ohtha, do.	2,119	2,055	1,744	9,108	10,030
propylene, solvents, and so forth						
Total	do.	77,413	77,990	75,879	88,070	82,208
0 0 1 0 11						

#### TABLE 1—Continued CHILE: PRODUCTION OF MINERAL COMMODITIES<sup>1</sup>

<sup>e</sup>Estimated; estimated data are rounded to no more than three significant digits; may not add to totals shown. <sup>p</sup>Preliminary. <sup>r</sup>Revised. do. Ditto. NA Not available. -- Zero.

<sup>1</sup>Table includes data available through September 30, 2008.

<sup>2</sup>In addition to the commodities listed, pyrite is also produced, but available information is inadequate to make reliable estimates of output. <sup>3</sup>Estimated from reported exports.

<sup>4</sup>Figures are the nonduplicate copper content of ore concentrates, blister and refined copper measured at the last stage of commercial production,

as reported by Comisión Chilena del Cobre (COCHILCO). Mine production reported by Servicio Nacional de Geología y Minería (SERNAGEOMIN) for the same years was only slightly higher (0.01% to 0.95%).

<sup>5</sup>Production of molybdenum oxide only from the CODELCO Norte Division of Corporación Nacional del Cobre de Chile (CODELCO).

<sup>6</sup>Rhenium content of mine output in Chile (whether processed in Chile or elsewhere) was estimated based on information from COCHILCO.

<sup>7</sup>Production of refined silver metal (granular) only from the Ventanas smelter and refinery.

<sup>8</sup>Figures included as part of kaolin or other clays production in chapters prior to 2006.

<sup>9</sup>Data revised owing to revelations by companies to SERNAGEOMIN that production previously reported for 2000–06 included production in Peru.

<sup>10</sup>Based on 63.17% potassium oxide equivalent for potassium chloride (sylvite) in Chile, as reported by SERNAGEOMIN, and rounded to four significant digits.

<sup>11</sup>Based on an assumed 51% potassium oxide equivalent for potassium sulfate, according to a minimum global average estimate and rounded to two significant

digits (Ober, J.A., 2007, Potash, in Metals and minerals: U.S. Geological Survey Minerals Yearbook 2006, v. I, p. 58.1).

<sup>12</sup>Not elsewhere specified.

<sup>13</sup>Includes production of natural sodium sulfate and anhydrous sodium sulfate, coproducts of the nitrate industry (salitre).

<sup>14</sup>Sulfur content of sulfuric acid as a byproduct of metallurgy and processing of mineral fuels, as reported by COCHILCO.

<sup>15</sup>Includes natural gasoline.

<sup>16</sup>Includes production from both imported and domestic petroleum, as reported by SERNAGEOMIN prior to 2006 and by Empresa Nacional del Petróleo (ENAP) for 2006 and 2007.

#### (Thousand metric tons unless otherwise specified)

Commodity	Major operating companies and major equity owners	Location of main facilities	Annual capacity
Barite	Sociedad Minera Godoy Schwenger y Cia.	La Calera, Region V	400 e
Bentonite	Sociedad Legal Minera Mabel Dos Primera de Arica	Quarry and plant near Arica, Region I	1 <sup>e</sup>
Boron compounds,	Química Industrial del Bórax Ltda. (private, Chile-based	Ulexite mine at Salar del Surire; and boric acid and	12 e
$B_2O_3$ content	investors, 100%)	agrochemical plants near Arica, Region I	
Do.	S.Q.M. Boratos S.C.M. [Sociedad Química y Minera de	Mine brines of Atacama Salar, and boric acid plant at	10
	Chile S.A. (SQM), 100%]	Antofagasta, Region II	
Do.	S.Q.M. Salar S.A. [Sociedad Química y Minera de	Plant in Santiago Metropolitan Region	NA
	Chile S.A. (SQM), 100%]		
Calcium carbonate,	Industria Nacional de Cemento S.A. (INACESA)	Quarries and plant near Copiapo, Region III	NA
natural	(Cementos Bío Bío S.A., 100%)	<b>C</b>	
Do.	Empresas El Melón S.A. (Cemento Melón S.A., 100%)	Quarries and plant, Region V	NA
Do.	Alfredo Villalobos Román Tarsicio S.A.	Plant at Illapel, Region IV	NA
Do.	Cal Hur S.A.	Plant at Copiapo, Region III	NA
Do.	César B. Formas Ortiz S.A.	Plant at Chañaral, Region III	NA
Do.	Explotaciones de Minas Tongoy Ltda.	Quarry and plant near Tongoy, Region IV	NA
Do.	Sociedad Minera e Industrial Las Palmas Ltda.	Quarry and plant near La Serena, Region IV	NA
Do.	Mario Alberto Pizarro A. S.A.	Plant at Los Vilos, Region IV	NA
Do.	Minera del Fierro S.A.	Mine and plant at Teno, Region VII	NA
Do.	Minera Río Colorado S.A	Mine and plant near Melipilla, Santiago Metropolitan	NA
D0.	Millera Rio Colorado S.A	Region	INA
Do.	Minera Trucco Ltda.	Mine and plant near Santiago, Santiago Metropolitan	NA
D0.	Millera Hucco Elda.		INA
	Control and Minerer El Criste Une de la Ode. De Deiseralas	Region	NT A
Do.	Sociedad Minera El Cristo Una de la Qda. De Pajonales	Quarry and plant near Copiapo, Region III	NA
Do.	Sociedad Minera Godoy Schwenger y Cia.	Mine and plant near La Calera, Region V	NA
Do.	Sociedad Minera Las Abuelitas Ltda.	Mine and plant near Melipilla, Santiago Metropolitan Region	NA
Do.	Socedad Contractual Minera Farellones	Mine and plant near Illapel, Region IV	NA
Do.	Sociedad Minera y Comercial Alegría y Cia Ltda.	Mine and plant at Coquimbo, Region IV	NA
Do.	Sociedad Contractual Minera Pirineos	Quarry and plant at Vallenar, Region III	NA
Do.	Cemento Polpaico S.A. (Holcim Ltd., 54.3%; Compañía de	Cerro Blanco plant, Santiago Metropolitan Region;	NA
	Consumidores de Gas de Santiago, 40.9%; other, 4.8%)	Mejillones plant, Region II; Coronel plant, Region VIII	
Cement	do.	do.	2,300
Do.	Cemento Melón S.A. (Lafarge S.A., 82%, and other	La Calera plant, Region V	1,600
	private, 18%)		
Do.	Cementos Bío Bío S.A. (private, 100%)	Talcahuano Plant, Region VIII	750
Do.	Industria Nacional de Cemento S.A. (INACESA), 100%	Plant near Antofagasta City, Region II	500
Do.	do.	Plant near Curico City, Region VII	1,000
Clays, unspecified	Minera Pacífico Ltda.	Quarries and plants in Region VI, and plant in Santiago	80 <sup>e</sup>
•		Metropolitan Region	
Do.	Compañía Minera Soledad Ltda.	Quarry and plant in Region VIII	10 e
Do.	Sociedad Minera Casablanca S.A.	Quarry and plant in Santiago Metropolitan Region	NA
Do.	Sociedad Minera Godoy Schwenger y Cia.	Quarry and plant near La Calera, Region V	NA
Do.	Minera Lealtad Ltda.	Quarry and plant at Til Til, Santiago Metropolitan	NA
		Region, and at Olmue, Region V	
Coal, bituminous	Empresa Nacional del Carbón S.A. (ENACAR)	Trongol Mine near Curanilahue, and plant at Lota,	100 <sup>e</sup>
and lignite		Region VIII	100
Do.	Carbonífera Victoria de Lebu S.A.	La Fortuna Mine near Lebu, Region VIII	NA
20.	[Empresa Nacional del Carbón S.A. (ENACAR), 99.99%		1011
	and other private 0.01%]	,	
Do	▲ <sup>2</sup>	Santa Fe 2 Mine near Curanilahue, Region VIII	N A
Do.	Inmobiliaria e. Inversiones Valle Hermoso Ltda.	. 0	NA 600 °
Do.	Chabunco S.A.	Bish Mine, Magallanes, Region XII	600 e
Copper, Cu content	Minera Escondida Ltda. (BHP Billiton Plc, 57.5%; Rio	Escondida open pit mine, two concentrator plants, an	1,450 °
	Tinto plc, 30%; Japan Escondida Corp., 10%;	oxide plant for cathode production (SX-EW <sup>1</sup> ), and a	
	International Finance Corp., 2.5%)	sulfide-leach plant for cathode production, Region II	<b>2</b> 00
Do.	Compañía Minera Cerro Colorado (BHP Billiton Plc, 100%)		200
Do.	Compañía Minera Cerro Colorado (BHP Billiton Plc, 100%)	Cerro Colorado Mine and SX-EW <sup>+</sup> plant	120

#### TABLE 2—Continued CHILE: STRUCTURE OF THE MINERAL INDUSTRY IN 2007

(Thousand metric tons unless otherwise specified)

Commodity	Major operating companies and major equity owners		Annual capacity
Copper, Cu content—	Compañía Minera Doña Inés de Collahuasi SCM	Collahuasi open pit mine, concentration plant, and	46
Continued	(Anglo American plc, 44%; Xstrata plc, 44%; companies led by Mitsui & Co. Ltd., 12%)	SX-EW <sup>1</sup> plant, at Ujina, Region I	
Do.	Corporación Nacional del Cobre (CODELCO) (Government, 100%)	CODELCO Norte Division, including Chuquicamata, Mina Sur, and Radomiro Tomic Mines; and Chuquicamata	97
		SX-EW <sup>1</sup> plant (oxide), smelter, and refinery (oxide and sulfide), and Radomiro Tomic SX-EW <sup>1</sup> plant, Region II	
Do.	do.	El Teniente Division and Mine, and Caletones Smelter (anodes) and Refinery (fire-refined ingots), Region VI	43
Do.	do.	Ventanas Division, Las Ventanas smelter and refinery (cathodes), Region V	40
Do.	do.	Andina Division, including Rio Blanco and Sur Sur Mines (concentrates), Region V	26
Do.	do.	Salvador Division, including Campamento Antiguo, Damiana Norte, and Inca Mines (concentrates), and Potrerillos SX-EW <sup>1</sup> plant and refinery (cathodes), Region II	8: II
Do.	Minera Los Pelambres S.A. (Antofagasta plc, 60%, and Japanese consortia, 40%)	Los Pelambres open pit mine and concentration plant, Region IV	36
Do.	Minera El Tesoro S.A. (Antofagasta plc, 100%)	El Tesoro open pit mine and SX-EW <sup>1</sup> plant, Region II,	10
Do.	Minera Michilla S.A. (Antofagasta plc, 74.2%, and other private Chilean investors, 25.8%)	Michilla Mine and SX-EW <sup>1</sup> /sulfide leaching plant, Region II	5
Do.	Empresa Nacional de Minería (ENAMI) (Government, 100%)	Hernán Videla Lira smelter (anodes and blister), Paipote, Region III	34
Do.	do.	Concentration plants: Manuel Antonio Matta, Paipote; Osvaldo Martínez, El Salado; and Vallenar, Region III; and José Antonio Moreno, Taltal, Region II	18
Do.	Minera Sur Andes Ltda. (Anglo American plc, 100%)	Los Bronces Mine (concentrates) and Tortolas SX-EW <sup>1</sup> plant (cathodes), Santiago Metropolitan Region	30
Do.	do.	Chagres smelter (anodes and blister), Region V	17
Do.	do.	El Soldado Mine (concentrates), Region V	7
Do.	Empresa Minera de Mantos Blancos S.A. (Anglo American plc, 99.9%, and other private, 0.1%)	Mantos Blancos open pit mine and SX-EW <sup>1</sup> plant, Region II	9
Do.	do.	Mantoverde open pit mine and SX-EW <sup>1</sup> plant, Region III	6
Do.	Xstrata Copper Chile S.A.	Altonorte smelter (anodes and blister), La Negra, Region II	29
Do.	Compañía Minera Xstrata Lomas Bayas (Xstrata plc, 100%)	Lomas Bayas Mine and SX-EW <sup>1</sup> plant, Region II	6
Do.	Sociedad Contractual Minera El Abra [Freeport-McMoRan Copper & Gold Inc., 51%, and Corporación Nacional del Cobre (CODELCO), 49%]	El Abra Mine and SX-EW <sup>1</sup> plant, near Calama, Region II	24
Do.	Cía. Contractual Minera Candelaria (Freeport-McMoRan Copper & Gold Inc., 80%, and SMMA Candelaria Inc., 20%)	Candelaria open pit mine, underground mine, and concentration plant, near Copiapo, Region III	23
Do.	Cía. Contractual Minera Ojos del Salado (Freeport-McMoRan Copper & Gold Inc., 80%, and SMMA Candelaria Inc., 20%)	Ojos del Salado Mine and concentration plant, near Copiapo, Region III	1
Do.	Compañía Minera Zaldívar (Barrick Gold Corp., 100%)	Zaldívar open pit mine and SX-EW <sup>1</sup> plant, Region II	15
Do.	Compañía Minera Quebrada Blanca [Teck Cominco Ltd., 76.5%, and Inversiones Mineras S.A., 13.5%, and Empresa Nacional de Minería (ENAMI), 10%]	Quebrada Blanca open pit mine and SX-EW <sup>1</sup> plant, Region I	8
Do.	Compañía Minera Carmen de Andacollo [Teck Cominco Ltd., 90%, and Empresa Nacional de Minería (ENAMI), 10%]	Carmen de Andacollo Mine and SX-EW <sup>1</sup> plant, Region IV	2
Do.	Alliance Copper Ltd. (Codelco Technologies Ltd., 100%)	Plant to acid-leach fine copper at Chuquicamata, Region II (from residual material produced at CODELCO Norte and El Teniente Divisions)	2

#### (Thousand metric tons unless otherwise specified)

Commo	dity	Major operating companies and major equity owners	Location of main facilities	Annual capacity
Copper sulfate	metric tons	Compañía Minera Cerro Negro	Portales Mine and a plant at Cabildo, Region V	200
Do.	do.	Sulfatos del Norte S.A. (Sulfanor S.A.)	Santa Rosa and Isidora Mines and a plant at Calama, Region II	10,000
Diatomite		Celite Chile Ltda. (IMERYS S.A., 100%)	Plant at Port of Arica, Region I	30 <sup>e</sup>
Dolomite		Industrias Nacional de Cemento S.A. (INACESA), 100%	Quarries and plant near Copiapo, Region III	30 e
Feldspar		Minera Alfa Quintay Ltda.	Quarry and plant, Santiago Metropolitan Region	10 <sup>e</sup>
Do.		Minera Pacífico Ltda.	Quarries and plants in Region VI, and plant in Santiago Metropolitan Region	NA
Ferromolybdenun	1	Molibdenos y Metales S.A. (MOLYMET) (private, 100%)	Nos plant, San Bernardo, 30 kilometers south of Santiago, Santiago Metropolitan Region	16 <sup>e</sup>
Gold:				
Metal ingots	kilograms	Corporación Nacional del Cobre (CODELCO), 100%	Ventanas refinery, Region V	6,000
Mine output	do.	Corporación Nacional del Cobre (CODELCO), 100% (byproduct of copper production)	Andina, CODELCO Norte, El Teniente, and Salvador Divisions	2,000 e
Do.	do.	Minera Escondida Ltda., 100%	Escondida copper mine and plants, Region II	5,600
Do.	do.	Cía. Contractual Minera Candelaria, 100%	Candelaria copper mine and plant, Region III	3,000 e
Do.	do.	Cía. Contractual Minera Ojos del Salado, 100%	Ojos del Salado copper mine and plant, Region III	470
Do.	do.	Minera Los Pelambres S.A., 100%	Los Pelambres Mine and plant, Region IV	1,200 <sup>e</sup>
Do.	do.	Empresa Nacional de Minería (ENAMI), 100%	Manuel Antonio Matta plant, Paipote; Osvaldo Martínez plant, El Salado; and Vallenar plant, Region III; and José Antonio Moreno plant, Taltal, Region II	400
Do.	do.	Compañía Minera Mantos de Oro (Kinross Gold Corp., 100%)	La Coipa Mine (La Coipa pit and Puren pit) and plant, Region III, 140 kilometers north of Copiapo	5,000 <sup>e</sup>
Do.	do.	Compañía Minera Maricunga (Kinross Gold Corp., 100%)	Maricunga open pit, heap-leach mine, Region III, 100 kilometers east of Copiapo (El Refugio Mine in 2006)	7,700
Do.	do.	Yamana Gold Inc., 100%	El Peñón Mine and concentration plant, Region I	7,500
Do.	do.	Minera Florida Ltda. (Yamana Gold Inc., 100%)	Minera Florida Mine and concentration plant, Region II	2,500
Do.	do.	Cerro Bayo Ltda. (Coeur d'Alene Mines Corp., 100%)	Cerro Bayo Mine and concentration plant, Laguna Verde, Region XI	1,300
Do.	do.	Sociedad Contractual Minera El Toqui Ltda. (Breakwater Resources Ltd., 100%)	El Toqui Mine and Doña Rosa concentration plant, Region XI, 120 kilometers north of Coyhaique	850
Gypsum, natural		Compañía Industrial El Volcán S.A. (Saint-Gobain Gypsum S.A., 100%)	El Volcan quarry near Santiago, Santiago Metropolitan Region	100
Do.		Compañía Minera Romeral S.A. (Etex Group S.A., 59.8%, and Lafarge S.A., 40.2%)	El Romeral quarry near Santiago, Santiago Metropolitan Region	50
Do.		Industria Nacional de Cemento S.A. (INACESA), 100%	Mantos verdes quarry near Antofagasta City, Region II	17 <sup>e</sup>
Do.		Antonio Zotti Rosetti y Cía. Sociedad Minera	La Confianza and San Jose Mines near Los Vilos, Region IV; Margarita and San Nicolas Mines, and a plant near Renca, Santiago Metropolitan Region	5 °
Iodine	metric tons	SQM Químicos S.A. [Sociedad Química y Minera de Chile S.A. (SQM), 100%]	Nueva Victoria Mine and plant, Region I; María Elena, Pampa Blanca, and Pedro de Valdivia Mines and plants, Region II	11,000
Do.	do.	Sociedad Contractual Minera Cosayach (Inverraz S.A., 100%)	Mine and plant near Iquique, Region I	4,000 <sup>e</sup>
Do.	do.	Atacama Minerals Chile Sociedad Contractual Minera (Atacama Minerals Corp., 100%)	Mine and plant in Aguas Blancas, Region II	1,500
Iron ore		Cía. Minera Santa Bárbara S.A. (Wyndham Explorations S.A. and Leonardo J. Farkas Klein, 51%, and Admiralty Resources NL, 49%)	Japonesa Mine, near Vallenar, Region III	1,500
Do.		Cía. Minera del Pacífico S.A. (CMP), 100% (subsidiary of CAP S.A.)	Cristales and El Algarrobo Mines, El Algarrobito and Huasco concentration plants, and Huasco pellets plant, Region III; El Romeral and El Tofo Mines, and El Romeral concentration and pellets-feed plants, Region IV; and El Laco concentration plant, Region II	9,000 <sup>e</sup>

(Thousand metric tons unless otherwise specified)

Commo	odity	Major operating companies and major equity owners	Location of main facilities	Annual capacity
Iron ore—Contin		Cía. Minera Huasco S.A. [Cía. Minera del Pacífico S.A. (CMP), 50%, and MC Inversiones Ltda., 50%]	Los Colorados Mine and concentration plant, Region III	NA
Kaolin		Minera Pacífico Ltda.	Quarries and plants in Region VI and plant in Santiago Metropolitan Region	20 <sup>e</sup>
Do.		Minera Trucco Ltda.	Quarry and plant in Santiago Metropolitan Region	NA
Do.	metric tons	Mario Alberto Pizarro A. S.A.	Plant at Los Vilos, Region IV	600 <sup>e</sup>
Lapis lazuli	do.	Las Flores de los Andes S.A.	Mine near Ovalle, Region IV	400 <sup>e</sup>
Lead, mine output	metric tons	Minera Florida Ltda. (Yamana Gold Inc., 100%)	Minera Florida Mine and concentration plant, Region II	480 <sup>e</sup>
Do.	do.	Sociedad Contractual Minera El Toqui Ltda. (Breakwater Resources Ltd., 100%)	El Toqui Mine and Doña Rosa concentration plant, Region XI, 120 kilometers north of Coyhaique	250 <sup>e</sup>
Lime, hydraulic		Industria Nacional de Cemento S.A. (INACESA) (Cementos Bío Sía, 100%)	Plants near Antofagasta City, Region II, and near Copiapo City, Region III	580
Do.		Soprocal Calerías e Industrias S.A.	Plant at Melipilla, Santiago Metropolitan Region	190 <sup>e</sup>
Lithium carbonat	e metric tons	Sociedad Chilena del Litio Ltda. (subsidiary of Chemetall GmbH, owned by Rockwood Holdings Inc., 100%)	Chemetalle Foote plant at La Negra, near the city of Antofagasta, Region II	26,000 e
Do.	do.	SQM Salar S.A. [subsidiary of Sociedad Química y Minera de Chile S.A. (SQM)] (private, 100%)	Plant at Salar del Carmen, near the city of Antofagasta, Region II	30,000
Lithium hydroxic	le do.	do.	do.	6,000
Manganese	do.	Manganesos Atacama S.A. (subsidiary of CAP S.A.)	Plant in Coquimbo city and mines in Region IV	15,000
Marble, dimensio	on stone do.	Pier Luigi Indri S.A.	Quarry at Cerrillos, Region III	200 <sup>e</sup>
Molybdenum, mine output	do.	Minera Sur Andes Ltda., 100%	Los Bronces Mine and Tortolas molybdenum flotation plant, Santiago Metropolitan Region	2,600
Do.	do.	Corporación Nacional del Cobre (CODELCO), 100%	CODELCO Norte Division, Region II	27,000
Do.	do.	do.	El Teniente Mine and Plant, Region VI	5,500
Do.	do.	do.	Andina Division, Region III	3,400
Do.	do.	do.	El Salvador Division, Region III	1,400
 Do.	do.	Minera Los Pelambres S.A., 100%	Los Pelambres Mine and plant, Region IV	11,000
 	do.	Compañía Minera Doña Inés de Collahuasi SCM, 100%	Collahuasi Mine and molybdenum plant, Region I	4,500 °
Molybdenum oxi		<b>.</b> .	Nos plant, San Bernardo, 30 kilometers south of Santiago,	4,500 30 °
		Molibdenos y Metales S.A. (MOLYMET) (private, 100%)	Santiago Metropolitan Region	
Do.	do.	Corporación Nacional del Cobre (CODELCO), 100%	CODELCO Norte Division, Region II	10 <sup>e</sup>
Natural gas	million	Empresa Nacional del Petróleo S.A. (ENAP)	About 23 oilfields, including Costa Auera, in the	2,200 e
	cubic meters	(Government, 100%)	Magallanes basin, Region XII	
Petroleum 42	thousand gallon barrels	do.	do.	6,500
Petroleum refiner	*	do.	Aconcagua, Bio Bio and Gregorio refineries	90,000 <sup>e</sup>
products				
Nitrates: Primarily sodiu nitrate	ım	SQM Nitratos S.A. [subsidiary of Sociedad Química y Minera de Chile S.A. (SQM)] (private, 100%)	Maria Elena, Pampa Blanca, and Pedro de Valdivia Mines and plants, and Coya Sur plant, Region II	770
Primarily pota nitrate	ssium	do.	do.	650
In fertilizer		Cosayach Nitratos S.A. (Inverraz S.A., 100%)	Mine and plant near Iquique, Region I	200 e
Do.		SQM Industrial S.A., 100%	Mine and plant near Santiago, in Region II	100 e
Pig iron		Cía. Siderúrgica Huachipato S.A. (subsidiary of CAP S.A.) (private, 100%)	Plant in Bahia de San Vicente, Region VIII, 14 kilometers northeast of Concepcion	1,200
Phosphate rock, a	patite	César B. Formas Ortiz S.A.	Mine near Chanaral, Region II	10 e
Do.	*	Compañía Minera El Sauce Ltda.	Mine near La Serena, Region IV	4 <sup>e</sup>
		Compañía Minera de Fosfatos Naturales Ltda. (Bifox	Mines at and around Bahia Inglesa; Osorno plant near	12 <sup>e</sup>
Phosphorite				12
Phosphorite		Ltda.) (TEHMCORP S.A., 100%)	Bahia Inglesa, Region III; and Bahia Inglesa plant at Caldera, Region IV	

(Thousand metric tons unless otherwise specified)

Comr	nodity	Major operating companies and major equity owners	Location of main facilities	Annual capacity
Potash (KCL an K <sub>2</sub> SO <sub>4</sub> ), K <sub>2</sub> C		SQM Salar S.A. [subsidiary of Sociedad Química y Minera de Chile S.A. (SQM)] (private, 100%)	Plant at Salar del Carmen, near the city of Antofagasta, Region II	500 °
Do.	do.		Chemetalle Foote plant at La Negra, near the city of	NA
		(Chemetall owned by Rockwood Holdings Inc., 100%)	Antofagasta, Region II	
Pumicite, inclu	ding	Industrias Nacional de Cemento S.A. (INACESA), 100%	Quarries and plant near Antofagasta, Region II, and	200 e
pozzolan	U		near Curico, Region VII	
Do.		Cemento Polpaico S.A.	Quarries and plant in Santiago Metropolitan Region	200 e
Do.		Compañía Minera Soledad Ltda.	Quarry and plant in Region VIII	NA
Do.		Empresas El Melón S.A.	Quarry at Rinconada Lo Vial near Maipu, and plant at	1,200
		1	Santiago, Santiago Metropolitan Region	
Do.		Harborlite Chile Ltda. (IMERYS S.A., 100%)	Laguna del Maule Mine at Talca, Region VII, and plant	NA
			at Santiago, Santiago Metropolitan Region	
Do.		Sociedad Minera Puzolana Maipú Ltda.	Quarry and plant near Maipu, Santiago Metropolitan	NA
		ľ	Region	
Pyrophyllite	metric tons	Sociedad Minera Godoy Schwenger y Cia.	Mine and plant near La Calera, Region V	1,800 e
Do.	do.	José Orrego Bugueño S.A.	Mine and plant near Chincolco, Region V	1,000 e
Do.	do.	Mario Alberto Pizarro A. S.A.	Plant at Los Vilos, Region IV	1,000 e
Rhenium,	kilograms	Molibdenos y Metales S.A. (MOLYMET)	Nos plant, San Bernardo, 30 kilometers south of Santiago,	24,500 e
metal	0	(private, 100%)	Santiago Metropolitan Region	,
Salt, NaCl		Sociedad Minera Punta de Lobos Ltda.	Santiago	6,000
		(K+S Aktiengesellschaft, 100%)		.,
Do.		Empresa Cristina Guerra Leiva S.A.	California Mine near Iquique, Region I	NA
Do.		Inversiones Alpina Ltda.	Plant at Iquique, Region I	NA
Do.		José Iván Zabaleta Andrade Ltda.	Mine and plant near Iquique, Region I	NA
 Do.		Sal Gema S.A.	do.	NA
Selenium	metric tons	Corporación Nacional del Cobre (CODELCO), 100%	Ventanas smelter and refinery, noble metals plants,	900 °
Scientum	metric tons	(byproduct of copper production)	Region V	900
Silica, quartz		Cedric Fernández y Compañía Ltda.	Mine and plant near Calama, Region II	100 <sup>e</sup>
Do.			La Confianza and San Jose Mines near Los Vilos,	20 <sup>e</sup>
D0.		Antonio Zotti Rosetti y Cía. Sociedad Minera		20
			Region IV; Margarita and San Nicolas Mines, and	
		Minun Alfo Oninter Ltda	a plant near Renca, Santiago Metropolitan Region	30 <sup>e</sup>
Do.		Minera Alfa Quintay Ltda.	Quarry and plant, Santiago Metropolitan Region	
Do.		Minera Pacífico Ltda.	do.	NA
Do.		Minera San Pedro Ltda.	Natacha Mine and El Rulo plant at Til-Til, Santiago	30 <sup>e</sup>
			Metropolitan Region	
Do.		SLM Santa Dorila de las Arenitas	Mine and plant at Constitucion, Region VII	250 °
Do.		Vidrios Lirquén S.A.	Mine and glass plant at Lirquen, Region VIII	80 <sup>e</sup>
Do.		Minera Arsil S.A.	Mine and plant at Concepcion, Region VIII	50 °
Do.		Cristalerías Toro S.A.	Mine at Rancagua, Region VI	120 <sup>e</sup>
Do.		Minera Granos Industriales Ltda.	El Turco Mine and Migrin Plant near Cartagena, Region V	250 <sup>e</sup>
Do.		Productora Cuarzo El Peral Ltda.	El Peral Mine and plant near Cartagena, Region V	250 <sup>e</sup>
Do.		Sociedad Legal Minera Pedro Luís	Mine and plant near Copiapo, Region III	120 <sup>e</sup>
Silver:				
Metal grains	kilograms	Corporación Nacional del Cobre (CODELCO), 100%	Ventanas refinery, Region V	160,000
Mine output	do.	do.	Andina, CODELCO Norte, El Teniente, and Salvador Divisions	330,000 <sup>e</sup>
Do.	do.	Compañía Minera Mantos de Oro	La Coipa Mine (primarily out of the Puren pit) and plant,	470,000 e
		(Kinross Gold Corp., 100%)	Region III, 140 kilometers north of Copiapo	
Do.	do.	Yamana Gold Inc., 100%	El Peñón Mine and concentration plant, Region I	200,000
Do.	do.	Minera Florida Ltda. (Yamana Gold Inc., 100%)	Minera Florida Mine and concentration plant, Region II	10,000
Do.	do.	Minera Escondida Ltda., 100%	Escondida copper mine and plants, Region II	185,000 °
Do.	do.	Empresa Nacional de Minería (ENAMI), 100%	Manuel Antonio Matta plant, Paipote; Osvaldo Martínez plant, El Salado; Vallenar plant, Region III; and José	6,000
			Antonio Moreno plant, Taltal, Region II	

#### (Thousand metric tons unless otherwise specified)

Commodi	ty	Major operating companies and major equity owners	Location of main facilities	Annual capacity
Silver-Continued:				
Mine output— Continued	kilograms	Cerro Bayo Ltda. (Coeur d'Alene Mines Corp., 100%)	Cerro Bayo Mine and concentration plant, Region XI	72,000 <sup>e</sup>
Do.	do.	Compañía Minera Doña Inés de Collahuasi SCM, 100%	Collahuasi Mine and plants, Region I	60,000 <sup>e</sup>
Do.	do.	Minera Los Pelambres S.A., 100%	Los Pelambres Mine and plant, Region IV	42,000 e
Do.	do.	Minera Sur Andes Ltda., 100%	Los Bronces Mine and plants, Santiago Metropolitan Region	40,000 e
Do.	do.	Cía. Contractual Minera Candelaria, 100%	Candelaria Mine and concentration plant, Region III	30,000 e
Do.	do.	Cía. Contractual Minera Ojos del Salado, 100%	Ojos del Salado copper mine and plant, Region III	4,500 <sup>e</sup>
Do.	do.	Sociedad Contractual Minera El Toqui Ltda.	El Toqui Mine and Doña Rosa concentration plant,	2,500
		(Breakwater Resources Ltd., 100%)	Region XI, 120 kilometers north of Coyhaique	
Sodium sulfate		SQM Químicos S.A. [Sociedad Química y Minera de Chile S.A. (SQM), 100%]	Nueva Victoria Mine, Region I, and Maria Elena Mine and Coya Sur plant, Region II	80
Do.		Luís Rojas Guerra y Compañía Ltda.	Plant at Antofagasta, Region II	NA
Do.		Sociedad Legal Minera Santa Inés Uno de Antofagasta	Santa Ines Mine near Antofagasta, Region II	NA
Steel, crude		Cía. Siderúrgica Huachipato S.A. (subsidiary of CAP S.A.) (private, 100%)	Primary plant in Talcahuano and plant in Rengo, Region VIII	1,220 °
Do.		Gerdau AZA S.A. of Brazil	Steel plants in Renca and Colina, Santiago Metropolitan Region	420
Sulfuric acid		Xstrata Copper Chile S.A. (Xstrata plc, 100%)	Altonorte Smelter, Region II	700
Do.		Minera Sur Andes Ltda. (Anglo American plc, 100%)	Chagres Smelter, Region V	500
Do.		Corporación Nacional del Cobre (CODELCO), 100%	Ventanas sulfuric acid plant, Region V	360
Do.		do.	Caletones Plant, Region VI	1,000 e
Do.		do.	Chuquicamata Plant, Region II	500 <sup>e</sup>
Do.		do.	Portrerillos Plant, Region III	100 <sup>e</sup>
Do.		Empresa Nacional de Minería (ENAMI), 100%	Hernán Videla Lira smelter, Paipote, Region III	290
Talc	metric tons	Sociedad Talco Eduardo Martín Abejón Ltda.	Mines near Constitucion, Region VII, and plant at Santiago, Santiago Metropolitan Region	1,000
Do.	do.	Minera Trucco Ltda.	Mine and plant near Santiago, Santiago Metropolitan Region	NA
Travertine,	do.	Mármoles San Marino Chile S.A. (Grupo San Marino S.A.,	Quarry near Calama, Region II, and plant in Til-Til,	7,000 <sup>e</sup>
dimension stone		100%)	Santiago Metropolitan Region	
Do.	do.	Standard Uno S.A.	Quarry and plant at Calama, Region II	6,000 <sup>e</sup>
Zeolites do. So		Sociedad Legal Minera Serrín Tercera	Serrin Tercera Mine and Remulcao Plant at Talca, Region VII	300 e
Zinc in concentrate	do.	Sociedad Contractual Minera El Toqui Ltda. (Breakwater Resources Ltd., 100%)	El Toqui Mine and Doña Rosa concentration plant, Region XI, 120 kilometers north of Coyhaique	35,000
		Minera Florida Ltda. (Yamana Gold Inc., 100%)	Minera Florida Mine and concentration plant, Region II	2,000

<sup>e</sup>Estimated; estimated data are rounded to no more than three significant digits. Do., do. Ditto. NA Not available. <sup>1</sup>Solvent-extraction/electrowinning.

# TABLE 3 CHILE: ESTIMATED RESERVES OF MAJOR MINERAL COMMODITIES IN $2007^1$

#### (Thousand metric tons unless otherwise specified)

			World	World
Con	nmodity	Reserves	ranking	percentage
Boron materials (B content) <sup>2</sup>		1,200	NA	NA
Coal, all types <sup>3</sup>	million metric tons	1,180	NA	NA
Copper, metal content		160,000	1	29.1
Gold, metal content	metric tons	2,000	6	2.4
Iodine		9,000	1	60.0
Iron ore, Fe content <sup>4</sup>		300,000	NA	NA
Lithium, metal content		3,000	1	73.2
Molybdenum		1,100	3	12.8
Natural gas <sup>5</sup>	million cubic meters	98,000	NA	NA
Nitrates <sup>2</sup>		41,550	NA	NA
Petroleum <sup>5</sup>	thousand 42-gallon barrels	150,000	NA	NA
Potash		10,000	12	1.2
Rhenium	metric tons	1,300	1	52.0
Selenium	do.	20,000	1	23.3
Sulfate $(SO_4 \text{ content})^2$		36,100	NA	NA
1 51 1111				

do. Ditto. NA Not available.

<sup>1</sup>Source: U.S. Geological Survey Mineral Commodity Summaries 2009.

<sup>2</sup>Only exploitable reserves of Sociedad Química y Minera de Chile S.A. (SQM), Source: SQM Annual Report, June 2008.

<sup>3</sup>U.S. Energy Information Administration, International Energy Annual, October 17, 2008.

<sup>4</sup>Only expoitable reserves of CAP S.A. in Chile, Source: CAP S.A. Memoria Anual, January 2007.

<sup>5</sup>Source: Oil & Gas Journal, v. 106, no. 48, PennWell Corp., December 22, 2008.