

THE MINERAL INDUSTRY OF

PHILIPPINES

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The Philippines is an archipelago comprising about 7,100 islands that lie just north of the Equator and about 1,100 kilometers east of the mainland of Southeast Asia. Its total land area covers approximately 300,000 square kilometers, of which probably one-third may be mineralized. The country has two major islands—Luzon in the north with an area of approximately 105,000 square kilometers and Mindanao in the south with an area of about 96,000 square kilometers. Together, these islands form two-thirds of the country's land surface; a group of nine other islands compose most of the remaining land area.

The Philippine archipelago includes 13 active volcanoes and lies within the Pacific "rim of fire," an orogenic belt associated with active ore-forming mineralization. Three principal ore deposit types are associated with this volcanic arc environment—large-tonnage porphyry copper/gold deposits; disseminated and vein-type gold deposits; and volcanic massive sulfide deposits containing primarily copper and gold.

The Philippines has a long, well-established history of major production from its mines and previously ranked among the world's top 10 in the production of chromite, copper, nickel, and gold. Production has been hampered, however, for much of the last two decades by the effects of low foreign investment owing to political instability; low international metal prices accompanied by high operating and production costs; labor problems; and natural disasters, including intense volcanic activity, cyclonic storms resulting in severe flooding, and periods of extensive drought. Foreign investment also was impeded by the requirement for 60% domestic equity control of the mining-processing facilities and high excise taxes (mineral royalties) on production. Copper output decreased approximately 50% during the period from 1988 to 1994, while gold production decreased by almost 60%. Increasing political stability, along with the modern Philippine Mining Act of 1995, has resulted in rising levels of mining development and exploration programs throughout the country (TVI Pacific Ltd., *The Philippines*, accessed May 19, 1998, at URL <http://www.tvipacific.com/general/philrep.htm>).

The mining/quarrying industry declined 3.2% in 1997, contributing about 1.2% to the country's gross domestic product (U.S. Embassy, Manila, *The Philippines*, 1998). Copper and gold remained the backbone of the country's mineral industry. As a result of the serious accident in March 1996, in which mine tailings spilled from Marcopper Mining Corp.'s copper mining operation on the island of Marinduque, all but 2 of the 70 applications from foreign mining companies for exploration licenses were frozen until early 1997.

The Philippine Mining Act (Republic Act 7942), enacted in March 1995, was designed to establish a legal framework for the mining sector and to streamline the law to ensure that the Philippines could compete effectively for foreign investment in the country's mineral

industry. The Act is one of the most modern in Southeast Asia and incorporates environmental provisions on a par with other established mineral-producing countries while also safeguarding the indigenous culture of local communities (Luna, 1998).

The Philippine Mining Law and its revised Implementing Rules and Regulations provide three major forms of mining rights—Exploration Permit (EP), Mineral Agreement (Mineral Production Sharing, Co-Production and Joint Venture), and Financial or Technical Assistance Agreement (FTAA). EP's and the FTAA's are modes of entry for foreign companies to have up to 100% ownership. An EP is limited for a maximum period of 6 years, by which time it should be converted to either a Mineral Agreement or an FTAA. Mineral Agreements are limited to Filipino corporations (minimum 60% Filipino-owned and maximum 40% foreign-owned). FTAA's are 25-year contracts involving a minimum investment commitment of \$50 million for infrastructure and mine development (Tanchuling and Villaluna, 1998). FTAA's are to be negotiated with the Department of Environment and Natural Resources (DENR) and proposals are to be filed with the Mines and Geosciences Bureau. The DENR is the primary Government agency responsible for conservation, management, development, and proper use of the country's natural resources, including its minerals.

The minerals industry of the Philippines employed an estimated 400,000 people, or about 1.5% of the labor force, including an estimated 300,000 workers engaged in small-scale mining and panning activities, chiefly in artisanal gold workings. The metallic sector accounted for an estimated 75% of the industry's production value and nearly 100% of mineral export earnings. Of the dozen or so major mining companies engaged in metal mining, six produced copper, gold, and silver from various operations; one of the six companies also produced refractory chrome ore; one additional company mined gold and silver; and two companies mined nickel ore. The industrial minerals sector was dominated by the production of limestone for cement manufacture and marble and sand and gravel for construction uses. Refined gold and copper continued to be the country's most important mineral products, each representing more than 30% of total mineral value.

Japan remained the primary market for the country's mineral products in 1997. Almost all the Philippine production of chromite and nickel and more than 60% of its copper concentrates were exported to Japan. The remaining copper concentrates were smelted by the Philippine Associated Smelting and Refining Corp. (PASAR) into copper cathodes at Isabel, Leyte Province, for export, again primarily to Japan.

Production of chromite in the Philippines continued to decline in 1997, with production only about 30% of that a decade ago. The country had long been a traditional supplier of refractory-grade chromite to the world market, but was overtaken by the Republic of South Africa. Refractory ore production was centered in Zambales

Province in northern Luzon where Benguet Corp. mined the world's largest single refractory chromite deposit at the Coto Mine in Masinloc (Industrial Minerals, 1998).

Forced to cease operations following the accident that spilled tons of tailings into the Boac River on the island of Marinduque in March 1996, Marcopper Mining Corp. laid off about 600 employees by yearend owing to serious financial difficulties resulting from its nonoperational status. Additionally, Marcopper spent much of its resources in rehabilitation of the damaged river and affected communities (Metal Bulletin, 1998a).

The Dizon copper/gold mine, a 50:50 joint venture of Benguet Corp. and Dizon Copper-Silver Mines Inc. (DCSMI), closed at the beginning of August because of mudslide and flood damage caused by a typhoon in May. At the end of December, Benguet's board of directors transferred its operating rights to the Dizon Mine in San Marcelino, Zambales Province, to the original claim owner, DCSMI. Under an agreement signed in November, Benguet made the transfer to DCSMI upon payment of a royalty interest in the remaining ore deposit, estimated to be 80.8 million metric tons (Mining Journal, 1997a).

Atlas Consolidated Mining and Development Corp., once the Philippines' major copper producer, was planning to invest US\$140 million to rehabilitate and reopen its largest copper mine in the Toledo District of central Cebu Island. The mine had been closed in January 1994 following problems relating to increasing debt, decreasing output, and the need to retrench employees. The rehabilitation was to begin early in 1998 and would take about 18 months to complete. Production from the copper ore body was scheduled to begin 5 months after the completion of the rehabilitation program. When the mine is fully operational, it will have a capacity of 42,000 tons per day of copper ore and 1,100 to 1,250 kilograms per year of gold (Metal Bulletin, 1997a).

Lepanto Consolidated Mining Co. closed its copper plant at Leyte in mid-December, laying off about 150 employees. The closure was due to the exhaustion of copper concentrates and a planned shift from copper to gold production (Mining Journal, 1997b).

At yearend, the Philippine Government unveiled plans to sell its 42% stake in the debt-ridden copper producer PASAR. The Government shares are held by the National Development Co. (NDC). In an effort to make the sale more attractive, NDC will write off much of the debt, providing the Congress assents. Debts of the huge copper smelter-refinery complex were estimated to have reached US\$1.161 billion by the end of 1996; assets were worth about US\$880 million (Metal Bulletin, 1998b). Earlier in the year, PASAR was forced to declare *force majeure* when a strike forced it to shut its smelter and to reduce its refinery capacity by 50%, which led to a backlog of concentrates at its warehouses in Leyte. PASAR bought an average of 600,000 tons per year of copper concentrates; of this, about 70% was supplied by mines in Canada, Chile, Indonesia, Papua New Guinea, and the United States (Mining Journal, 1997c).

The privatization of PASAR also will include the neighboring debt-ridden Philphos, the Philippine's largest phosphate fertilizer plant, supplying about 70% of the domestic market. The two plants are interdependent—PASAR supplied its sulfuric acid byproduct to Philphos (Metal Bulletin, 1997c).

In June, TVI Pacific Inc. received full regulatory permission to develop its Canatuan polymetallic gold/silver project in Zamboanga del Norte Province on Mindanao Island. This allowed TVI to

finalize arrangements for construction of a full-scale plant, with first production scheduled during the second quarter of 1999. A pilot plant operated until yearend, processing 80 tons per day of ore from which bullion was produced (TVI Pacific Ltd., Development—Canatuan, accessed January 23, 1998, at URL <http://www.tvipacific.com/ops/ops.htm>).

Manganese output is centered on the islands of Bohol, Busuanga, Marinduque, Masbate, and Siquijor, as well as in the Provinces of Agusan del Norte and Zamboanga del Sur on Mindanao. Many of the deposits, however, are small and unsuitable for large-scale mining operations.

The mainstay of Philippine nickel production continued to be Rio Tuba Nickel Mining Corp.'s Rio Tuba Mine in the far south of Palawan Island, Palawan Province. Taganito Mining Corp. operated the Taganito Mine on Palawan Island. Taganito and Hinatuan Mining Corp. operated smaller mines in Surigao del Norte Province on Mindanao. All worked lateritic nickel deposits, exporting all ore production to Japan.

Pacific Nickel Ltd. (formerly Arboyne NL) announced at yearend that it had completed an agreement regarding a restructuring of the ownership of the Nonoc laterite nickel mine, smelter, and refinery, previously operated by Philnico Mining and Industrial Corp., on Nonoc Island, Surigao del Norte Province. Pacific Nickel had held an option to acquire Pacific Nickel Holdings Ltd., a company registered in the British Virgin Islands that acquired a controlling interest in the project from the State-owned Asset Privatization Trust (APT) in June. The option, however, expired unexercised at the start of September, but apparently, Pacific Nickel will be able to obtain an interest of just 1% in the project. The Nonoc complex, capable of producing about 35,000 tons per year of nickel, has been idle since 1986. A refurbishment program, estimated to cost US\$200 million, was planned to be done by Kvaerner, an Anglo-Norwegian group. Philnico completed acquisition of a 90% interest in Nonoc Mining and Industrial Corp., which owns the mine, refinery, and infrastructure, from APT, which retained the balance at yearend (Mining Journal, 1998).

The Philippines did not have a fully integrated steel sector, although several rod and bar mills and galvanizing plants had been established since the end of World War II. Steelmaking in the Philippines involved scrap-based electric-arc furnace steel melting operations, of which there were 17 facilities in 1997—13 in the National Capital Region (NCR), comprising Manila, the capital; 3 in Pampanga Province to the northwest of the NCR; and National Steel Corp.'s (NSC) steelworks at Iligan, Mindanao. The single largest steel company in the country, NSC produced about one-third of total production. NSC, previously a Government-owned entity, was purchased by Malaysia's Wing Tiek Holdings in mid-1996.

The Philippine Sinter Corp., owned by Kawasaki Steel Corp. of Japan, imported iron ore fines from various overseas sources, primarily Australia, and exported iron ore sinter and pellets to Japan. The plant was opened in 1977 and had a capacity of 5 million tons per year.

In the first quarter, Hong Kong's Hottic Investments Ltd. formally acquired 82.5% of NSC by paying US\$800 million to Wing Tiek, NSC, and the National Development Co. The payment completed all obligations of Wing Tiek to the Government in relation to the steel company's privatization, as well as fulfilling the balance of equity holdings due to NSC (Metal Bulletin, 1997b).

Coal in the Philippines generally is classified as lignite or

subbituminous and is of poor quality for use in power generation. Higher grade imported coal was blended with indigenous coals to improve burning characteristics.

The Philippines produced only about 2% of its crude petroleum requirements domestically, with about 95% of production coming from the West Linapacan Field in the Palawan Basin off the northwest coast of Palawan Island. Remaining domestic production was from the reopening of the Matinloc Field and the older Nido Field, both in the Palawan Basin in the South China Sea. With oil production from these fields expected to cease in 1998, the Filipino energy industry will turn its attention to development of the Camago-Malampaya gas field, the country's first commercial gas find offshore Palawan. The National Power Co. and Shell Philippines Exploration concluded a gas sales agreement to use gas from the Camago-Malampaya Field to supply a planned 3,000-megawatt power-plant, scheduled to be converted from the mothballed Bataan nuclear facility and be in operation by 2002. Along with speculation that a liquefied natural gas plant could be supported by the field, two additional power projects were planned. First Gas Holdings, a joint venture of First Philippine Holdings Co. (60%) and British Gas International (40%) signed a US\$515 million engineering, construction, and procurement contract with Siemens of Germany for a 990-megawatt combined cycle, gas turbine power station at Batangas, about 100 kilometers south of Manila. A long-term fuel supply contract for condensate was signed with Enron, pending gas supply from the Camago-Malampaya Field in 2001-02. The Enron contract will then be modified to a back-up fuel contract. Shell Philippines and Occidental Philippines were planning to construct a 500-kilometer pipeline from the field to the main island of Luzon. The Filipino Department of Energy already has approved the construction of 80 kilometers of offshore pipeline by Shell Philippines and Occidental Philippines (Petroleum Economist, 1997).

In the first part of the year, Petron Corp., a 40% Government-owned entity and the Philippine's largest petroleum company, announced plans to construct a US\$2 billion oil refinery. The new refinery was central to the company's strategy to defend its market share of more than 42%. The refinery was due to begin operating in 2000 with a capacity of 200,000 barrels per day.

In September, the Philippine Supreme Court nullified as unconstitutional the Downstream Oil Industry Act of 1996 (Republic Act 8180), which deregulated the downstream oil industry. In announcing the decision, the court condemned the law's "anti-competitive provisions" and said that the law could not be allowed to stand "while Congress is working to remedy its defects," in effect ordering the immediate return to regulation of oil prices by the Energy Regulatory Board (U.S. Embassy, Manila, the Philippines, 1997).

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Major Sources of Information

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Major Publications

Central Bank of the Philippines, Manila: Statistical Bulletin and Annual Report.

Chamber of Mines of the Philippines, Manila: Newsletter and Annual Report.

Mines and Geosciences Bureau, Manila: Mineral News Service and Annual Report.

TABLE 1
PHILIPPINES: PRODUCTION OF MINERAL COMMODITIES 1/

(Metric tons unless otherwise specified)

Commodity 2/	1993	1994	1995	1996	1997 e/
METALS					
Arsenic: White (equivalent of arsenic acid)	-- r/	-- r/	-- r/	-- r/	--
Chromium: Chromite, gross weight	61,732 r/	76,003 r/	111,035 r/	78,345 r/	87,500 3/
Copper:					
Mine output, Cu content	136,257	116,163	108,063	54,807 r/	46,959 3/
Metal:					
Smelter	212,446	200,255	242,171 r/	201,661 r/	206,160 3/
Refined	165,954	154,713	158,109	155,774 r/	146,630 3/
Gold, mine output, Au content	21,155	27,059	27,144	31,800 r/	33,800
Iron and steel:					
Ferroalloys, electric-furnace:					
Ferrochromium	11,908	16,186	50,450	6,736 r/	--
Ferromanganese e/	5,000	5,000	5,000	--	--
Ferro silicon e/	10,000	10,000	10,000	--	--
Steel, crude	623	473	923 r/	920 r/	950
Lead: Metal, secondary refined	24,300	17,200	17,200 e/	17,200 e/	17,000
Manganese ore and concentrate, gross weight	12,418	1,600 r/ e/	-- r/	-- r/	--
Nickel, mine output, Ni content	7,663	9,895	15,075	14,700 e/	15,000
Silver, mine output, Ag content	28,043	29,562	26,870	25,095 r/	19,625 3/
INDUSTRIAL MINERALS					
Barite	-- r/	-- r/	-- r/	-- r/	--
Cement, hydraulic e/	7,962 3/	10,400 r/	10,600 r/	12,000 r/	15,000
Clays:					
Bentonite	5,050	3,415 r/	7,636 r/	8,000 r/ e/	8,000
Red e/	791 3/	800	800	800	800
White	5,557	5,800 r/	8,233 r/	5,000 r/ e/	6,000
Other e/	700,000	800,000	800,000	800,000	800,000
Feldspar	21,564 r/	43,805 r/	25,950 r/	25,000 r/ e/	25,000
Gypsum and anhydrite, natural	-- r/	-- r/	-- r/	-- r/	--
Lime e/	10,000	10,000	10,000	10,000	10,000
Magnesite e/	18,500 r/	18,000 r/	700	700	700
Perlite	19,779	5,017 r/	17,133 r/	20,000 e/	20,000
Phosphate:					
Guano	5,250 r/	6,147 r/	57 r/	5,000 e/	5,000
Phosphate rock	91,779	25,158 r/	32,150 r/	30,000 r/ e/	30,000
Pyrite and pyrrhotite (including cuprous), gross weight e/	316,980 3/	320,000	320,000	320,000	320,000
Salt, marine	535,481	562,255 r/	540,000 e/	550,000 e/	550,000
Sand and gravel: e/					
Silica sand	201 r/ 3/	650 r/ 3/	800	800	800
Other 4/	15,913 3/	15,000	15,000	15,000	15,000
Stone: e/					
Dolomite	108,150 3/	675,000	675,000	675,000	675,000
Limestone 5/	5,190 3/	5,000	5,000	5,000	5,000
Marble (dimension), unfinished	359,394 3/	300,000	300,000	300,000	300,000
Volcanic cinder	2,000	2,000	2,000	2,000	2,000
Tuff	3,264 3/	3,000 r/	3,000 r/	3,000 r/	3,000
Quartz	50,000	50,000	50,000	50,000	50,000
Crushed, broken, other 6/	1,000	1,000	1,000	1,000	1,000
Sulfur: e/					
S content of pyrite	114,000	100,000	100,000	100,000	100,000
Byproduct of metallurgy	147,000	125,000	125,000	125,000	125,000
MINERAL FUELS AND RELATED MATERIALS					
Coal, all grades	1,531	1,458 r/	1,320	1,800 r/ e/	1,800
Petroleum:					
Crude	3,321	1,825	1,044	432	300
Refinery products:					
Liquefied petroleum gas	2,607	2,806	3,650 r/	3,600 r/ e/	3,600
Gasoline	13,052	12,168	15,330 r/	15,000 r/ e/	15,000
Jet fuel	3,058	4,352	5,110 r/	5,000 r/ e/	5,000
Kerosene	4,270	3,916	5,110 r/	5,000 r/ e/	5,000

See footnotes at end of table.

TABLE 1--Continued
 PHILIPPINES: PRODUCTION OF MINERAL COMMODITIES 1/

(Metric tons unless otherwise specified)

Commodity 2/	1993	1994	1995	1996	1997 e/	
MINERAL FUELS AND RELATED MATERIALS--Continued						
Petroleum--continued:						
Refinery products--continued:						
Distillate fuel oil	thousand 42-gallon barrels	25,213	26,338	31,390 r/	31,000 r/ e/	31,000
Residual fuel oil	do.	28,431	29,582	29,200 r/	29,000 r/ e/	29,000
Other	do.	5,886	5,230	10,220 r/	10,000 r/ e/	10,000
Refinery fuel and losses	do.	3,300	3,262	(7/)	4,000 r/ e/	4,000
Total	do.	62,830	64,412	70,810 r/	74,000 r/ e/	74,000

e/ Estimated. r/ Revised.

1/ Table includes data through June 3, 1998.

2/ In addition to the commodities listed, the Philippines produced platinum-group metals as byproducts of other metals, but output was not reported quantitatively, and no basis is available to make estimates.

3/ Reported figure.

4/ Included "pebbles" and "soil" not further described.

5/ Excluded limestone for road construction.

6/ Included materials described as rock, crushed or broken; stones, cobbles, and boulders; rock aggregates; and broken adobe.

7/ Refinery fuel and losses for 1995 have been included in the output of the individual petroleum products. Total refinery fuel and losses for 1995 was 4,015 thousand 42-gallon barrels.

TABLE 2
PHILIPPINES: STRUCTURE OF THE MINERAL INDUSTRY FOR 1997

(Thousand metric tons unless otherwise specified)

Commodity	Major operating companies and major equity owners	Location of main facilities	Annual capacity e/
Cement	Rizal Cement Co. Inc., 100%	Binangonan plant, Luzon Island, Rizal Province	964
Do.	Davao Union Cement Corp., 100%	Davao City plant, Mindanao Island, Davao del Sur Province	648
Do.	Iligan Cement Corp., 100%	Iligan City plant, Mindanao Island, Lanao del Norte Province	420
Chromite:			
Concentrate	Alamag Processing Corp., operator (Pacific Shore Mining Co., 50%; and Rio Chico Mining Corp., 50%)	Llorente, Eastern Samar Province, Samar Island	20 1/
Do.	Benguet Corp., 70%, operator; and Consolidated Mines Inc., 30%	Masinloc Chromite Operations, Zambales Province, Luzon Island	105 2/
Do.	Acoje Mining Co. Inc., operator (Voest Alpine AG of Austria, 75.6%; and Merlin Mining NL of Australia, 24.4%)	Santa Cruz Mine, Zambales Province, Luzon Island	100 3/
Ferrochromium	Philippine Minerals and Alloy Corp., 100%	Manticao plant, Misamis Oriental Province, Mindanao Island 4/	30
Do.	Integrated Chrome Corp., 100%	Manticao plant, Misamis Oriental Province, Mindanao Island 4/	28
Do.	Ferrochrome Philippines Inc., 100%	Tagoloan plant, Misamis Oriental Province, Mindanao Island 4/	50
Coal	Semirara Coal Corp. (Government), manager (Voest Alpine AG of Austria, 60%; National Development Corp., 36%; and Development Bank of the Philippines, 4%)	Unong Mine, Antique Province, Semirara Island	1,000
Copper, metal content	Benguet Corp., 50%, operator; and Dizon Copper-Silver Mines Inc., 50%	Dizon Copper-Gold Operation, Zambales Province, Luzon Island	16
Do.	Kingking Mines Inc. (Echo Bay Mines Ltd., operator, 75%; and TVI Pacific Inc., 25%)	Kingking Mine, Zamboanga del Norte Province, Mindanao Island	50
Copper, metal content	Marcopper Mining Corp., 60%; and Placer Dome Inc. of Canada, 40%	Marcopper (also known as San Antonio) Mine, Marinduque Province, Marinduque Island 4/	30
Do.	Philex Mining Corp., 100%	Santo Tomas II (Padcal) Mine, Benguet Province, Luzon Island	25
Do.	Maricalum Mining Corp., manager [Asset Privatization Trust (Government), 100%]	Sipalay Mine, Negros Occidental Province, Negros Island	30
Do.	Atlas Consolidated Mining and Development Corp., 100%	Toledo Mine, Cebu Province, Cebu Island 5/	15
Copper, metal, refined	Philippine Associated Smelting and Refining Corp., operator. [National Development Corp. (Government), 42%; Japanese consortium of companies led by Marubeni Corp., 31%; domestic copper producers led by Atlas Consolidated Mining and Development Corp., 22%; and International Finance Corp. (United Nations Agency), 5%]	Isabel, Leyte Province, Leyte Island	172
Gold	Benguet Corp., 100%	Benguet Antamok Gold Operation, Benguet Province, Luzon Island	3,000
Do.	do.	Benguet Gold Operations, Benguet Province, Luzon Island 7/	1,100 6/
Do.	Philex Mining Corp., 100%	Bulawan Mine, Negros Occidental Province, Negros Island 7/	2,800
Do.	TVI Pacific Inc., 100%	Canatuan Mine, Zamboanga del Norte Province, Mindanao Island 7/	2,200
Do.	United Paragon Mining Corp., operator (Paragon Resources of Australia, 12.5%; and public shares, 87.5%)	Longos Mine, Camarines Norte Province, Luzon Island	1,800
Do.	Philippine Gold PLC, 100%	Masbate Gold Operations, Masbate Province, Masbate Island	2,500 6/
Iron ore, sinter	Philippine Sinter Corp., operator (Kawasaki Steel Corp. of Japan, 100%)	Cagayan de Oro, Misamis Oriental Province, Mindanao Island	5,000 7/
Nickel, ore	Rio Tuba Nickel Mining Corp., 60%; and Japanese interests, 40%	Rio Tuba Mine, Palawan Province, Palawan Island	500
Do.	Taganito Mining Corp., 100%	Taganito Mine, Palawan Province, Palawan Island	100

See footnotes at end of table.

TABLE 2--Continued
 PHILIPPINES: STRUCTURE OF THE MINERAL INDUSTRY FOR 1996

(Thousand metric tons unless otherwise specified)

Commodity	Major operating companies and major equity owners	Location of main facilities	Annual capacity e/
Petroleum thousand 42-gallon barrels	Caltex (Philippines) Inc., 100%	Caltex Batangas Refinery, Batangas Province, Luzon Island	68
Do.	Petron Corp., operator [Philippine National Oil Co. (Government), 100%]	Petron Bataan Refinery, Bataan Province, Luzon Island	156
Do.	Pilipinas Shell Petroleum Corp., 100%	Shell Batangas Refinery, Batangas Province, Luzon Island	70
Steel	National Steel Corp., operator. [Wing Tiek Holdings of Malaysia, 100%]	Iligan, Lanao del Norte Province, Mindanao Island	350

e/ Estimated.

1/ Chemical-grade concentrates.

2/ Refractory-grade concentrates.

3/ Metallurgical-grade concentrates.

4/ Operations ceased March 24, 1996 because of a severe tailings discharge; planned to restart in 1998.

5/ Production scheduled to begin mid-1999 following rehabilitation.

6/ Closed since 1992 because of typhoon damage.

7/ In planning stage during year.

TABLE 3
PHILIPPINES: RESERVES OF MAJOR MINERAL COMMODITIES FOR 1997

(Thousand metric tons unless otherwise noted)

Commodity	Reserves
METALS	
Chromite:	
Chemical	2,791
Metallurgical (lump plus sand)	25,431
Refractory	8,445
Copper, primary	4,789,519
Gold, primary	226,852
Iron	484,696
Lead, primary	6,313
Manganese	2,551
Mercury	16,243
Molybdenum	30,608
Nickel	1,088,854
INDUSTRIAL MINERALS	
Asbestos	5,811
Barite	163
Bauxite	408,241
Clays:	
Ball clay	38,624
Bentonitic	6,648
Feldspathic	11,515
Fire clay	263,829
Kaolinitic	9,742
Siliceous	120,074
Diatomaceous earth	4,573
Feldspar	22,706
Guano	298
Gypsum	2,054
Limestone	28,044,415
Cement raw materials	16,978,082
Dolomitic	370,573
Lime raw materials	1,203,271
Marblelized	444,113
Magnesite	52,276
Marble	10,815,008 1/
Pebbles	22,557 1/
Perlite	13,922
Pumice and pumicite	21,981
Pyrite	13,798
Rock aggregates	1,467,166
Rock phosphate	513
Sand and gravel	82,863 1/
Shale	1,145,297
Silica	2,766,257
Quartz-Massive	60,089 1/
Sand	296,844 1/
Siliceous rock-Massive	1,425,201 1/
Sulfur	19,534
Talc	9
Tuff	149,624

1/ Thousand cubic meters.

Source: Mines and Geosciences Bureau, Department of Environment and Natural Resources.