

# THE MINERAL INDUSTRY OF THE PHILIPPINES

By Travis Q. Lyday

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 was hampered 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. Nevertheless, in 1999, the Philippines ranked second to Indonesia in the Asia Pacific region in terms of mineral prospectivity and resources (Resource Information Unit, 2000, p. 12).

In 1999, the mining industry was dominated by only seven companies. Lepanto Consolidated Mining Co. Inc., Manila Mining Corp., Maricalum Mining and Industrial Corp., and Philex Mining Corp. accounted for all the country's copper production and more than 80% of the total gold production. The remaining 20% of the gold was produced by a large small-scale mining sector that included several thousand mechanized alluvial gold operations and primitive manual gold panning-sluicing workings by numerous individuals. The remaining three companies Hinatuan Mining Corp., Rio Tuba Mining Corp., and Taganito Mining Corp., produced nickel in raw form (Resource Information Unit, 2000, p. 17). The previous few years witnessed the closure of Atlas Consolidated Mining and Development Corp.'s Toledo Copper and Masbate gold projects (1994), Benguet Corp.'s Paracale gold project (1994), Marcopper Mining Corp.'s Marcopper copper-gold-silver mine (1996), Benguet's Antamok gold project (1998), Dizon Copper-Silver Mines Inc.'s Dizon Mine (1998), and Itogon-Suyoc Mines Inc.'s Itogon and Suyoc Mines (1998). These mines and companies were considered to be the country's biggest producers during their time (De Vera, 2000, p. 20). The minerals industry was estimated to have contributed less than 1% to the country's gross domestic product (GDP), which was estimated to be \$74.6 billion in 1999, a real GDP growth rate increase estimated to be 3.0% compared with that of 1998 (U.S. Bureau of Economic and Business Affairs, 2000).

## Government Policies and Programs

In 1995, the Philippines enacted a new Mining Act (Republic Act 7942) that changed the system of mineral lands disposition from leasehold to mining agreements that were 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 minerals industry. At least partially as a result of Marcopper's accident in March 1996 in which about 4 million metric tons (Mt) of

material was spilled into the Boac River system and coastal areas of Marinduque Island because of a tailings dam failure, some rules and regulations of the act were revised and new ones written to incorporate a setting for environmental protection and social responsibility, as well as for mineral resource development. The act became one of the most modern in the Asia-Pacific area because its environmental provisions are on a par with other established mineral-producing countries and it safeguards the indigenous culture of local communities (Luna, 1998, p. 7).

The Philippine Mining Law provides 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). The EP's and the FTAA's are modes of entry for foreign companies to have up to 100% ownership of a mining project. An EP is limited to a maximum period of 6 years, by which time it will need to 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 that involve a minimum investment commitment of \$50 million for infrastructure and mine development (Tanchuling and Villaluna, 1998, p. 2-3). FTAA's were to be negotiated with the Department of Environment and Natural Resources (DENR), and proposals were 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, which include its minerals.

## Structure of the Mineral Industry

The minerals industry of the Philippines employed an estimated 400,000 people, or about 1.5% of the labor force; of that total an estimated 300,000 workers were engaged in small-scale mining and panning activities, chiefly in artisanal gold workings. The metallic sector accounted for an estimated 44% of the industry's production value and nearly 100% of mineral export earnings. The industrial minerals sector, which was dominated by the production of limestone for cement manufacture and marble and sand and gravel for construction uses, brought in the remaining nonfuel mineral production value (De Vera, 2000, p. 20). Refined gold and copper continued to be the country's most important mineral products, each of which was estimated to represent more than 30% of total mineral value.

## Trade

Japan was the primary market for the country's mineral products. Nearly all the Philippine production of nickel and more than 60% of its copper concentrates were exported to Japan. The remaining copper concentrates were smelted by Philippine Associated Smelting and Refining Corp. (Pasar) into copper cathodes at Isabel, Leyte Province, on Leyte Island, for export, again primarily to Japan; Pasar was the country's only copper producer and one of Asia's largest copper refineries.

On May 14, the Government formally approved the \$84.5 million bid for 37.72% of its 41.91% controlling interest in Pasar. Copper Smelting Investments Ltd. (CSIL), which was a 60-40 joint venture between a Filipino businessman and Swiss-based Glencore International AG, submitted the winning bid among three others on May 3. The bidding terms did not include a floor price (Metal Bulletin, 1999c). Beginning in June, lawsuits were being filed against CSIL, now known as Pasar Holdings Inc., that claimed that the sale was grossly disadvantageous to the Government, among other allegations (Metal Bulletin, 1999b). In December, the Supreme Court of the Philippines dismissed the lawsuits that alleged that the sale was detrimental to the Government and the Filipino people (Mining Journal, 1999c). At yearend, the Government's privatization of Pasar resulted in Pasar Holdings having the controlling interest of 37.72%; three Japanese companies, a combined 31.23%; eight Filipino mining companies, combined 21.78%; the Philippine Government, through its National Development Corp., 4.19% and the International Finance Corp., 5.08% (Mining Journal, 1999b).

## Commodity Review

### Metals

**Copper, Gold, and Silver.**—The Santo Tomas II copper-gold-silver mine at Padcal (and thus primarily called the Padcal Mine) near Baguio City on Luzon Island was the first underground block-caving operation in the Far East and has been mined continuously since 1958. Initially, it was an open cut operation, and subsequently became an underground mine. Its remaining mine life was estimated to be 10 to 15 years. In 1999, Philex Mining, which owned the mine, modified the free-gold recovery circuit to maximize gold recovery and bullion production (Resource Information Unit, 2000, p. 39).

Benguet's Antamok gold-silver opencut mine at Itogon on Luzon Island began commercial operation in early 1992 and was suspended in mid-1998 primarily owing to the fall in the gold price. The carbon-in-leach/carbon-in-pulp treatment plant had a throughput capacity of 3,500 metric tons per day. Antamok remained on care-and-maintenance throughout 1999 (Resource Information Unit, 2000, p. 63).

Production from Philex Gold Philippines Inc.'s Bulawan Mine (Philex Mining controlled 81.8% of Philex Gold Philippines) near Sipalay on Negros Island began in 1996 with ore supplied to the mill from opencut and underground operations. Owing to a low gold price, the open-cut operation was closed in mid-1998, but heap-leaching of the lower grade

stacked ore continued. Also owing to the low gold price, a 15% retrenchment of the work force (about 130 personnel) was instituted during the first quarter of 1999 (Resource Information Unit, 2000, p. 65).

The Canadian firm TVI Pacific Inc. of Calgary, Alberta, received all major Government approvals for it to proceed with its Canatuan polymetallic (copper-gold-silver-zinc) massive sulfide project near Siocon in Zamboanga del Norte Province on Mindanao Island. TVI had been conducting an extensive exploration program that included surface geological mapping, diamond drilling, and test pitting, as well as underground mapping and sampling of the small-scale mine workings, since it acquired the property from Benguet, which retained a 12.5% buy-back right, in 1995. In June 1999, a Japanese group signed a letter of intent to develop and earn a 40% joint-venture share by making a cash payment to TVI and by providing or arranging 75% of the total cost of the project, which was estimated to be \$18.5 million (TVI Pacific Inc., 1999b). Construction of the project was scheduled to begin in mid-2000, and concentrate production, in mid-2001 (Asian Journal of Mining, 1999b). In December, the Japanese group completed the drilling program, which consisted of five holes that provided samples for metallurgical test work. The ore intersections and grades determined from the drilling confirmed previous drill core results and enhanced the confidence of continuity of the ore zones and their thicknesses and grades (TVI Pacific Inc., 1999a).

In 1998, Climax Mining Ltd., which was based Sydney, Australia, completed a bankable feasibility study that had been based on a 1996 study which had defined the geological resources for a large-scale open pit to mine gold-copper ore from the Dinkidi porphyry deposit, which is 200 kilometers (km) northeast of Manila on Luzon Island. Owing to the fall in the price of both commodities following the baseline study, Climax reworked the study to focus on development of only the high-grade central core of the ore body (Resource Information Unit, 2000, p. 66-67). In August, the DENR issued an environmental compliance certificate for the project to Climax. The certificate was issued only after an extensive community consultation program that involved local and provincial governments and securing their acceptance and support for the Dinkidi Project, which was the first FTAA granted by the Philippine Government to a foreign company (Mining Journal, 1999a). At yearend 1999, negotiations were in progress for the mining of the Dinkidi central core by block-caving methods following a small startup open pit operation. Development was expected to take about 18 months, and full production was scheduled to begin in 2001 (Resource Information Unit, 2000, p. 66-67). Climax was expected to produce 13,000 metric tons per year (t/yr) of copper-in-concentrate and 4,400 kilograms per year of gold for its initial 9-year mine life. Discussions were held with a number of financial institutions to raise the \$138 million development costs (Metal Bulletin, 1999a).

**Nickel.**—All the beneficiated nickel silicate ore produced at Hinatuan Mining's Hinatuan Mine in Surigao Province on Hinatuan Island was sold to Pacific Metals Co. Ltd. of Japan under an agreement concluded in 1980. The limonitic nickel

resources were contracted to Australia's Yabulu Refinery in Townsville, Queensland, operated by Billiton Plc.'s wholly owned subsidiary QNI Pty. Ltd. (Resource Information Unit, 2000, p. 83-84).

The Nonoc nickel complex, which was closed in 1986, comprised a nickel laterite mine, smelter, and refinery, which included a powerplant, deep-water port, airstrip, and employee housing among other facilities. Numerous factors were involved in the shutdown, such as high debt levels, a decline in the value of the peso, high interest rates, low metal prices, and increasing oil prices. In late 1998, owing primarily to falling world nickel prices, the majority owner Philnico Mining and Industrial Corp. was prompted to alter its modest rehabilitation program for the 29,500 t/yr (65-million-pound-per-year) refinery by switching from the traditional ammonia leach methods of the 1970's to the latest pressure acid leach (PAL) technology of the late 20th century. PAL technology would be beneficial because it is more energy efficient and permits the use of lower grade material previously considered waste, and the operation would be cleaner as a result of the environmental upgrades in using PAL technology. In early 1999, the Anglo-Norwegian engineering group Kvaerner Metals completed a second-stage feasibility study for the revised project, and financial negotiations got underway. Construction completion and precommissioning was scheduled for April-May 2000, and refinery startup, in August 2001 (Resource Information Unit, 2000, p. 84).

## Mineral Fuels

**Coal.**—Coal in the Philippines generally was classified as lignite or subbituminous and was of poor quality, although it continued to be the Philippines' largest source of fossil energy production. Higher grade imported coal was blended with indigenous coals to improve the burning characteristics for use in electrical power generation. Semirara Coal Corp. (SCC), which was the principal Philippine coal company, produced coal from three seams that average a 7 to 1 stripping ratio on remote Semirara Island, which is 350 km south of Manila (Mining Journal, 1998). The government of Antique Province on the island approved SCC's plans to open another mining area about 8 km from its present site that would enable SCC to produce about 45 Mt of coal during 40 years (Asian Journal of Mining, 1999a).

**Natural Gas.**—The country's first commercial natural gas discovery was the Malampaya Field, which had been discovered in 1992, off the northwestern coast of Palawan Island. Operator Shell Pilipinas Exploration, along with Texaco Inc. of the United States (45% interest each) and the Philippine National Oil Co. (10%), was developing it and drawing upon the field's estimated 70.8 billion cubic meters of gas reserves to supply feed for 20 years to three electric powerplants with a combined 2,700-megawatt capacity that were under construction at Batangas on Luzon Island by National Power Corp. and First Gas Power. Shell Pilipinas and its partners were building a 504-km underwater pipeline from the Malampaya Field, around the eastern side of Mindoro Island to

Batangas to transport the gas to the powerplants; this pipeline was one of the largest-ever foreign investment projects in the country and possibly the longest deep-water pipeline in the world. The project was scheduled to be completed in late 2001 or early 2002 (U.S. Energy Information Administration, April 2000, Country analysis brief—Philippines, accessed May 9, 2000, at URL <http://www.eia.doe.gov/emeu/cabs/philippi.html>).

**Oil.**—Although the Philippines had no significant crude oil production in 1999, it did produce about 4,000 barrels per day (bbl/d) of oil, or only about 1% of the 370,000 bbl/d that it consumed. Though proven oil reserves are small, limited exploration was done during 1999 in the Philippines. Australia-based Nido Petroleum Philippines (formerly Sydney Oil Co. Drilling and Exploration) was conducting offshore exploration in the Cagayan Northwest and Southwest Palawan Basins.

## Infrastructure

The transportation infrastructure of the Philippines was moderately developed. There were 199,950 km of roads—including 39,590 km paved and 160,360 km unpaved. Inland waterways, of which there were 3,219 km usable for shallow-draft [less than 1.5-meter (m)] vessels, were of little importance to the transportation industry. The public sector railway system consisted of 492 km of narrow (1.067-m) gauge track. Of 266 airports, 76 had permanent-surface runways. International shipping ports included Batangas, Cagayan de Oro, Cebu, Davao, Guimaras Island, Iligan, Iloilo, Jolo, Legaspi, Manila, Masao, Puerto Princesa, San Fernando, Subic Bay, and Zamboanga. The merchant marine fleet included 168 bulk or combination bulk ore freighters; 47 petroleum-oil-lubricant tankers; 13 liquefied gas tankers; 5 chemical tankers; and 2 specialized tankers. Pipelines included 357 km for petroleum products (U.S. Central Intelligence Agency, 2000, World Factbook—Philippines, accessed October 25, 2000, at URL <http://www.odci.gov/cia/publications/factbook/geos/rp.html>).

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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/	1995	1996	1997	1998	1999
<b>METALS</b>					
Chromium, chromite, gross weight	111,035	107,068 r/	87,500	53,871	19,566
Copper:					
Mine output, Cu content	108,063	61,600 r/	49,000 r/	46,600 r/	36,850
Metal:					
Smelter	242,171	201,661	206,160	198,088 r/	192,000 e/
Refined	158,109	155,774	146,630	152,400 r/	148,200
Gold, mine output, Au content kilograms	27,023 r/	30,180 r/	32,671 r/	34,038 r/	31,031
Iron and steel:					
Ferroalloys, electric-furnace:					
Ferrochromium	50,450	6,736	--	--	--
Ferromanganese	5,000 e/	--	--	--	--
Ferrosilicon	10,000 e/	--	--	--	--
Steel, crude thousand tons	923	920	950	950 e/	900 e/
Lead, metal, secondary refined e/	17,200	17,200	17,000	17,000	17,000
Nickel, mine output, Ni content	15,075	14,539	18,137	12,840 r/	8,450
Silver, mine output, Ag content kilograms	26,870	25,095	19,625	18,220 r/	17,559
<b>INDUSTRIAL MINERALS</b>					
Cement, hydraulic thousand tons	10,554	12,429	14,681	12,888 r/	12,556
Clays:					
Bentonite	7,636	8,000 e/	8,000 e/	3,900 r/	1,844
Red e/	800	800	800	1,180 r/ 3/	-- 3/
White	8,233	5,000 e/	6,000 e/	1,783 r/	7,820
Other e/	800,000	800,000	800,000	6,000 r/ 3/	-- 3/
Feldspar	25,950	25,000 e/	25,000 e/	2,938 r/	16,740
Lime	10,000 e/	10,000 e/	10,000 e/	5,997 r/	7,829
Magnesite e/	700	700	700	700	700
Perlite	17,133	20,000 e/	20,000 e/	6,356 r/	10,265
Phosphate: e/					
Guano	57 3/	50 r/	50 r/	25 r/	-- 3/
Phosphate rock	32,150 3/	30,000	30,000	8,000 r/ 3/	105,000 3/
Pyrite and pyrrhotite (including cuprous), gross weight e/	320,000	320,000	320,000	320,000	320,000
Salt, marine	535,400	492,100	492,100	727,754 r/	704,347
Sand and gravel: e/					
Silica sand thousand tons	800	800	800	16,107 r/ 3/	27,295 3/
Other 4/ thousand cubic meters	15,000	15,000	15,000	15,000	15,000
Stone: e/					
Dolomite	675,000	675,000	675,000	210,230 r/ 3/	714,720 3/
Limestone 5/ thousand tons	5,000	5,000	5,000	28,500 r/ 3/	14,400 3/
Marble (dimension), unfinished cubic meters	300,000	300,000	300,000	98,000 r/ 3/	378,000 3/
Volcanic cinder do.	2,000	2,000	2,000	2,000	2,000
Tuff	3,000	3,000	3,000	1,540 r/ 3/	1,550
Quartz	50,000	50,000	50,000	50,000	50,000
Crushed, broken, other 6/ thousand cubic meters	1,000	1,000	1,000	1,570 r/ 3/	2,112 3/
Sulfur, all forms e/	178,000 r/	163,000 r/	103,000 r/	132,000 r/	110,000
<b>MINERAL FUELS AND RELATED MATERIALS</b>					
Coal, all grades thousand tons	1,200 r/	900 r/	1,000 r/	1,200 r/	1,200
Petroleum:					
Crude thousand 42-gallon barrels	1,044	432	292	300 e/	1,460 3/
Refinery products: e/					
Liquefied petroleum gas do.	3,650 3/	4,000 r/	5,475 r/ 3/	5,500 r/	5,500
Gasoline do.	15,330 3/	15,000	18,615 r/ 3/	18,500 r/	18,500
Jet fuel do.	5,110 3/	5,000	6,570 r/ 3/	6,500 r/	6,500
Kerosene do.	5,110 3/	5,000	4,380 r/ 3/	4,500 r/	4,500

See footnotes at end of table.

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

(Metric tons unless otherwise specified)

Commodity 2/	1995	1996	1997	1998	1999	
MINERAL FUELS AND RELATED MATERIALS--Continued						
Petroleum--Continued:						
Refinery products--Continued:						
Distillate fuel oil	thousand 42-gallon barrels	31,390 3/	31,000	40,150 r/ 3/	40,000 r/	40,000
Residual fuel oil	do.	29,200 3/	29,000	47,450 r/ 3/	47,000 r/	47,000
Other	do.	10,220 3/	10,000	9,855 r/ 3/	10,000 r/	10,000
Refinery fuel and losses	do.	(7/)	4,000	5,110 r/ 3/	5,000 r/	5,000
Total	do.	100,010 3/	103,000 r/	137,605 r/ 3/	137,000 r/	137,000

e/ Estimated. r/ Revised. -- Zero.

1/ Table includes data through October 3, 2000.

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 reliable 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 were 4,015 thousand 42-gallon barrels.

TABLE 2  
PHILIPPINES: STRUCTURE OF THE MINERAL INDUSTRY IN 1999

(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, Rizal Province, Luzon Island	964	
Do.	Davao Union Cement Corp., 100%	Davao City plant, Davao del Sur Province, Mindanao Island	648	
Do.	Iligan Cement Corp., 100%	Iligan City plant, Lanao del Norte Province, Mindanao Island	420	
Chromite, concentrate 1/	Benguet Corp., 100%	Masinloc opencut mine, 150 kilometers northwest of Manila, Zambales Province, Luzon Island	105	
Do.	do.	Zamboanga del Norte Province, Mindanao Island 2/	1	
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	Manila Mining Corp., 100%	Placer opencut mine, 50 kilometers southeast of Surigao, Surigao del Norte Province, Mindanao Island	4	
Do.	Philex Mining Corp., 100%	Santo Tomas II (Padcal) underground mine, south of Baguio City, Benguet Province, Luzon Island	8	
Do.	Maricalum Mining and Industrial Corp., 100%	Sipalay opencut mine, 10 kilometers northeast of Sipalay, Negros Occidental Province, Negros Island	7	
Do.	Lepanto Consolidated Mining Co. Inc., 100%	Victoria underground mine, 80 kilometers north of Baguio City, Benguet Province, Luzon Island	1	
Copper, metal, refined	Philippine Associated Smelting and Refining Corp., operator. Pasar Holdings Inc., 37.72%; Japanese consortium comprised of Itochu Corp., Marubeni Corp., and Sumitomo Corp., 31.23%; Eight Filipino companies holding 21.78% collectively; International Finance Corp., 5.08%; and National Development Corp. (Government), 4.19%	Isabel, Leyte Province, Leyte Island	172	
Gold, ore throughput	million tons	Benguet Corp., 100%	Antamok opencut mine, Itogon, Benguet Province, Luzon Island 3/	1
Do.	do.	Philex Gold Philippines Inc., 100%	Bulawan underground mine, 20 kilometers southeast of Sipalay, Negros Occidental Province, Negros Island 4/	1
Do.	do.	TVI Pacific Inc., 100%	Canatuan open pit mine, east of Siocon, Zamboanga del Norte Province, Mindanao Island 2/	1
Do.	do.	Climax Mining Ltd. of Australia, 100%	Dinkidi underground mine, 200 kilometers northeast of Manila, Luzon Island	NA
Do.	do.	Manila Mining Corp., 100%	Placer opencut mine, 50 kilometers southeast of Surigao, Surigao del Norte Province, Mindanao Island	4
Do.	do.	Philex Mining Corp., 100%	Santo Tomas II (Padcal) underground mine, south of Baguio City, Benguet Province, Luzon Island	8
Do.	do.	Maricalum Mining and Industrial Corp., 100%	Sipalay opencut mine, 10 kilometers northeast of Sipalay, Negros Occidental Province, Negros Island	7
Do.	do.	Lepanto Consolidated Mining Co. Inc., 100%	Victoria underground mine, 80 kilometers north of Baguio City, Benguet Province, Luzon Island	1
Iron ore, sinter	Philippine Sinter Corp., operator (Kawasaki Steel Corp. of Japan, 100%)	Cagayan de Oro, Misamis Oriental Province, Mindanao Island 5/	5,000	
Nickel, ore	Hinatuan Mining Corp., 100%	Hinatuan opencut mine, Surigao del Norte Province, Hinatuan Island	250	
Do.	Rio Tuba Mining Corp., 100%	Rio Tuba opencut mine, Bataraza, Palawan Province, Palawan Island	400	
Do.	Taganito Mining Corp., 100%	Taganito opencut mine, Claver, Surigao del Norte Province	400	

See footnotes at end of table.

TABLE 2--Continued  
PHILIPPINES: STRUCTURE OF THE MINERAL INDUSTRY IN 1999

(Thousand metric tons unless otherwise specified)

Commodity		Major operating companies and major equity owners	Location of main facilities	Annual capacity <sup>e/</sup>
Nickel		Philnico Mining and Industrial Corp., 90%; and Asset Privatization Trust (Government of the Philippines), 10%	Nickel mine-smelter-refinery complex on a 60-hectare site 20 kilometers east-northeast of Surigao City, Nonoc Island, Surigao del Norte Province 6/	NA
Petroleum products thousand 42-gallon barrels		Caltex (Philippines) Inc., 100%	Caltex Batangas Refinery, Batangas Province, Luzon Island	84
Do.	do.	Petron Corp., operator [Philippine National Oil Co. (Government), 100%]	Petron Bataan Refinery, Bataan Province, Luzon Island	180
Do.	do.	Pilipinas Shell Petroleum Corp., 100%	Shell Batangas Refinery, Batangas Province, Luzon Island	137
Silver, ore throughput	million tons	Benguet Corp., 100%	Antamok opencut mine, Itogon, Benguet Province, Luzon Island 3/	1
Do.	do.	Philex Gold Philippines Inc., 100%	Bulawan underground mine, 20 kilometers southeast of Sipalay, Negros Occidental Province, Negros Island 4/	1
Do.	do.	TVI Pacific Inc., 100%	Canatuan open pit mine, east of Siocon, Zamboanga del Norte Province, Mindanao Island 2/	1
Do.	do.	Manila Mining Corp., 100%	Placer opencut mine, 50 kilometers southeast of Surigao, Surigao del Norte Province, Mindanao Island	4
Do.	do.	Philex Mining Corp., 100%	Santo Tomas II (Padcal) underground mine, south of Baguio City, Benguet Province, Luzon Island	8
Do.	do.	Maricalum Mining and Industrial Corp., 100%	Sipalay opencut mine, 10 kilometers northeast of Sipalay, Negros Occidental Province, Negros Island	7
Do.	do.	Lepanto Consolidated Mining Co. Inc., 100%	Victoria underground mine, 80 kilometers north of Baguio City, Benguet Province, Luzon Island	1
Steel		National Steel Corp., operator. [Wing Tiek Holdings of Malaysia, 100%]	Iligan, Lanao del Norte Province, Mindanao Island	350
Zinc, ore throughput	million tons	TVI Pacific Inc., 100%	Canatuan open pit mine, east of Siocon, Zamboanga del Norte Province, Mindanao Island 2/	1
Do.	do.	Manila Mining Corp., 100%	Placer opencut mine, 50 kilometers southeast of Surigao, Surigao del Norte Province, Mindanao Island	4

e/ Estimated. NA Not available.

1/ Refractory-grade concentrates.

2/ Construction scheduled to begin in mid-2000.

3/ On care-and-maintenance status since April 1998.

4/ Open cut operations were suspended in June 1998.

5/ In planning stage during year.

6/ Mine construction rehabilitation and precommissioning was scheduled for April-May 2000, and refinery startup, in August 2001.



TABLE 3  
PHILIPPINES: RESERVES OF MAJOR MINERAL COMMODITIES IN 1999

(Thousand metric tons unless otherwise noted)

Commodity	Reserves
<b>METALS</b>	
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
<b>INDUSTRIAL MINERALS</b>	
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, the Philippines.