

# THE MINERAL INDUSTRY OF THE PHILIPPINES

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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.

With the country's gross domestic product (GDP) decreasing by only about 0.5% in 1998, the economy of the Philippines appears to have weathered the Asian economic crisis better than many of its Southeast Asian neighbors. The mining and quarrying industry of the Philippines is estimated to contribute less than 1% to the country's GDP. Copper and gold are the most important mining products.

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 employs 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 accounts for an estimated 75% of the industry's production value and nearly 100% of mineral export earnings. The industrial minerals sector is dominated by the production of limestone for cement manufacture and marble and sand and gravel for construction uses. Refined gold and copper continue to be the country's most important mineral products, each representing more than 30% of total mineral value.

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

In October, Benguet Corp. suspended mining and milling operations at its Masinloc chromite mine in Zambales Province owing to a decline in demand for chromite products, an increase in production costs, and an excess inventory of processed ore (Benguet Corp., 1998, p. 1).

Although forced to cease operations following the accident that spilled about 4 million tons of tailings into the Boac River system and coastal areas of Marinduque Island in March 1996, Marcopper Mining Corp. will be able to resume operations at its Marcopper copper mine upon completing the cleanup of the areas affected by the spill. An extensive environmental impact assessment, however, will have to be completed before mining can resume. The company and its former partner, Canada's Placer Dome Inc., have already spent millions of dollars in rehabilitating the area inundated by tailings from the country's worst mining disaster. The mine has an estimated remaining life of 17 years (Metal Bulletin, 1998a).

Atlas Consolidated Mining and Development Corp. continued to pursue plans to rehabilitate its copper mines in the Toledo District of central Cebu Island, severely damaged in 1992 by a powerful typhoon and eventually closed in January 1994 following problems relating to increasing debt, decreasing output, and the need to retrench employees to regain its position as one of Asia's largest mining companies (Chamber of Mines of the Philippines Newsletter, 1998).

In November, the Government scheduled for the first quarter of 1999 the sale of its majority interest in the debt-ridden PASAR. The Government's interest in PASAR is held through the National Development Co. The other shareholders in PASAR include domestic mining companies, Japanese corporations, and the International Finance Corp. The sale is

part of the Government's privatization program (Metal Bulletin, 1998b).

In April, Benguet suspended mining and milling operations at its Benguet Antamok Gold Operation in Benguet Province owing to financial difficulties and adverse weather conditions caused by La Niña weather patterns. During the third quarter, Benguet reviewed possible redevelopment of the Acupan Mine that previously contributed about 70% of production at the Benguet Gold Operations (BGO) in Benguet Province (Benguet Corp., 1998). BGO has been closed since 1992 owing to typhoon flooding damage.

Lepanto Consolidated Mining Co. is expanding the mill at its Victoria gold mine in northern Benguet Province. The expansion will double the capacity of the mill from 2,000 metric tons per day (t/d) of ore to 4,000 t/d over a 2-year period at a cost of \$30 million (Mining Journal, 1998b).

In October, Canada's TVI Pacific Inc. announced it had entered into a joint-venture agreement with Goldrush Mineral Exploration Corp., a private Philippines company, to continue exploration of the Rapu Rapu gold-silver and Buenavista gold projects. Rapu Rapu is in Albay Province and Buenavista is in Quezon Province on Luzon Island (TVI Pacific Inc., 1998).

A prefeasibility study by Kvaerner Metals of Australia concluded that Mindex ASA's Sablayan nickel-cobalt project on Mindoro Island has the potential to become one of the world's lowest-cost nickel producers. Mindex expected production to begin in 2002-03, subject to obtaining financing and all necessary permits, at \$0.66 per kilogram of nickel, after cobalt credits, at a capacity of 40,000 metric tons per year. The study also included the Alpha and Beaufort deposits on Palawan Island (Asian Journal of Mining, 1998).

In September, falling world nickel prices prompted Philnico Mining and Industrial Corp. to change its rehabilitation plans for the Nonoc nickel refinery on Nonoc Island in the southern Philippines from the traditional ammonia leach method to the pressure acid leach process. The change will delay by at least 2 years, until mid-2001, the projected start of operations at the plant, which has been idle since 1986. In February, Kvaerner Metals began the prefeasibility study into using the pressure acid leach process already being installed in Western Australian nickel operations. The pressure acid leach process improves metal recovery from just under 80% to 90% or more (Metal Bulletin, 1998c).

Coal in the Philippines generally is classified as lignite or subbituminous and is of poor quality. Higher grade imported coal is blended with indigenous coal to improve the burning characteristics for use in power generation. Semirara Coal Corp., the principal Philippine coal company, produces coal from three seams with an average stripping ratio of 7:1 on the remote island of Semirara, 350 kilometers south of Manila (Mining Journal, 1998a).

The Philippines had no significant crude oil production in 1998, producing only about 1% of its petroleum requirements domestically. The country's first commercial gas find, the Malampaya-Camago Field off the northwestern coast of Palawan Island, is being developed to supply feed for three electric powerplants under construction by National Power Corp. and First Gas Power. Pilipinas Shell Petroleum Corp. is

building a pipeline to transport the gas to the powerplants. The project is scheduled to be completed late in 2001 (U.S. Energy Administration, July 1999—Philippines country analysis brief, accessed July 7, 1999, at URL <http://www.eia.doe.gov/emeu/cabs/philippi.html>).

The state-operated Philippine National Oil Co. drilled for gas on Fuga Island north of the main island of Luzon, and a group led by Australia's Stirling Resources NL drilled for gas near Cebu Island in the central Philippines during the year.

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## Major Sources of Information

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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

DENR, North Avenue, Diliman  
Quezon City, Metro Manila, Philippines

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/ METALS	1994	1995	1996	1997	1998 e/
Chromium, chromite, gross weight	76,003	111,035	78,345	87,500	53,871 3/
Copper:					
Mine output, Cu content	116,163	108,063	54,807	46,959	48,600
Metal:					
Smelter	200,255	242,171	201,661	206,160	200,000
Refined	154,713	158,109	155,774	146,630	149,600
Gold, mine output, Au content kilograms	27,059	27,144	31,800	33,800 e/	25,000
Iron and steel:					
Ferroalloys, electric-furnace:					
Ferrochromium	16,186	50,450	6,736	--	--
Ferromanganese e/	5,000	5,000	--	--	--
Ferro silicon e/	10,000	10,000	--	--	--
Steel, crude thousand tons	473	923	920	950	950
Lead, metal, secondary refined e/	17,200 3/	17,200	17,200	17,000	17,000
Manganese ore and concentrate, gross weight	1,600 e/	--	--	--	--
Nickel, mine output, Ni content	9,895	15,075	14,539 r/	18,137 r/	27,300
Silver, mine output, Ag content kilograms	29,562	26,870	25,095	19,625	13,200
INDUSTRIAL MINERALS					
Cement, hydraulic thousand tons	9,571 r/	10,554 r/	12,429 r/	14,681 r/	13,338 3/
Clays: e/					
Bentonite	3,415 3/	7,636 3/	8,000	8,000	8,500
Red	800	800	800	800	800
White	5,800 3/	8,233 3/	5,000	6,000	6,000
Other	800,000	800,000	800,000	800,000	800,000
Feldspar	43,805	25,950	25,000 e/	25,000 e/	25,000
Lime e/	10,000	10,000	10,000	10,000	10,000
Magnesite e/	18,000	700	700	700	700
Perlite	5,017	17,133	20,000 e/	20,000 e/	20,000
Phosphate: e/					
Guano	6,147 3/	57 3/	5,000	5,000	5,000
Phosphate rock	25,158 3/	32,150 3/	30,000	30,000	30,000
Pyrite and pyrrhotite (including cuprous), gross weight e/	320,000	320,000	320,000	320,000	320,000
Salt, marine	562,255	535,400 r/	492,100 r/	492,100 r/	495,000
Sand and gravel: e/					
Silica sand thousand tons	650 3/	800	800	800	800
Other 4/ thousand cubic meters	15,000	15,000	15,000	15,000	15,000
Stone: e/					
Dolomite	675,000	675,000	675,000	675,000	675,000
Limestone 5/ thousand tons	5,000	5,000	5,000	5,000	5,000
Marble (dimension), unfinished cubic meters	300,000	300,000	300,000	300,000	300,000
Volcanic cinder do.	2,000	2,000	2,000	2,000	2,000
Tuff	3,000	3,000	3,000	3,000	3,000
Quartz	50,000	50,000	50,000	50,000	50,000
Crushed, broken, other 6/ thousand cubic meters	1,000	1,000	1,000	1,000	1,000
Sulfur: e/					
S content of pyrite	100,000	100,000	100,000	100,000	100,000
Byproduct of metallurgy	125,000	125,000	125,000	100,000 r/	100,000
MINERAL FUELS AND RELATED MATERIALS					
Coal, all grades thousand tons	1,458	1,320	1,800 e/	1,800 e/	1,800
Petroleum:					
Crude thousand 42-gallon barrels	1,825	1,044	432	292 r/	300
Refinery products:					
Liquefied petroleum gas do.	2,806	3,650	3,600 e/	3,600 e/	3,600
Gasoline do.	12,168	15,330	15,000 e/	15,000 e/	15,000
Jet fuel do.	4,352	5,110	5,000 e/	5,000 e/	5,000
Kerosene do.	3,916	5,110	5,000 e/	5,000 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/	1994	1995	1996	1997	1998 e/	
MINERAL FUELS AND RELATED MATERIALS--Continued						
Petroleum--Continued:						
Refinery products--Continued:						
Distillate fuel oil	thousand 42-gallon barrels	26,338	31,390	31,000 e/	31,000 e/	31,000
Residual fuel oil	do.	29,582	29,200	29,000 e/	29,000 e/	29,000
Other	do.	5,230	10,220	10,000 e/	10,000 e/	10,000
Refinery fuel and losses	do.	3,262	(7/)	4,000 e/	4,000 e/	4,000
Total	do.	87,654	100,010	102,600 e/	102,600 e/	102,600

e/ Estimated. r/ Revised.

1/ Table includes data through June 23, 1999.

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 was 4,015 thousand 42-gallon barrels.

TABLE 2  
PHILIPPINES: STRUCTURE OF THE MINERAL INDUSTRY IN 1998

(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
<b>Chromite:</b>			
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	30
Do.	Integrated Chrome Corp., 100%	do.	28
Do.	Ferrochrome Philippines Inc., 100%	Tagoloan plant, Misamis Oriental Province, Mindanao Island	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	kilograms Benguet Corp., 100%	Benguet Antamok Gold Operation, Benguet Province, Luzon Island	3,000
Do.	do. do.	Benguet Gold Operations, Benguet Province, Luzon Island 6/	1,100
Do.	do. Philex Mining Corp., 100%	Bulawan Mine, Negros Occidental Province, Negros Island 7/	2,800
Do.	do. TVI Pacific Inc., 100%	Canatuan Mine, Zamboanga del Norte Province, Mindanao Island 7/	2,200
Do.	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.	do. Philippine Gold PLC, 100%	Masbate Gold Operations, Masbate Province, Masbate Island 6/	2,500
Iron ore, sinter	Philippine Sinter Corp., operator (Kawasaki Steel Corp. of Japan, 100%)	Cagayan de Oro, Misamis Oriental Province, Mindanao Island 7/	5,000
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 IN 1998

(Thousand metric tons unless otherwise specified)

Commodity	Major operating companies and major equity owners	Location of main facilities	Annual capacity e/
Petroleum	Caltex (Philippines) Inc., 100%	Caltex Batangas Refinery, Batangas Province, Luzon Island	68
thousand 42-gallon barrels			
Do.	do. Petron Corp., operator [Philippine National Oil Co. (Government), 100%]	Petron Bataan Refinery, Bataan Province, Luzon Island	156
Do.	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 1999.

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 IN 1998

(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.