

THE MINERAL INDUSTRY OF

BURMA

By John C. Wu

Burma, also known as Myanmar, has rich and large mineral resources of precious and semiprecious stones, such as jade, ruby, and sapphire. Burma's mineral resources of barite, copper, lead, tin, tungsten, and zinc are rich but not large. Its mineral resources of antimony, coal, gold, iron, monazite, natural gas, nickel, petroleum, and silver are fairly rich but not large. Burma's other mineral resources including bauxite, bentonite, beryllium, clays, chromium, diamond, feldspar, fluorspar, gypsum, kaolin, manganese, mercury, mica, platinum, and sulfur are poor and small (Ko Ko Myint, 1994). However, the potential of finding more minerals or extending ore reserves of the identified minerals is good, because about 43% of the country has not yet been geologically mapped and explored.

In 1996, production of metallic minerals included chromium, copper, gold, lead, manganese, nickel, silver, tin, tungsten, and zinc. Production of industrial minerals included barite, clays, dolomite, feldspar, gypsum, limestone, salt, and precious and semiprecious stones. Production of mineral fuels included coal, natural gas, and crude petroleum. Mine production of most nonfuel minerals decreased, while production of coal and natural gas increased considerably in 1996. (*See table 1.*)

The output of the mining sector contributed about 1.3% to Burma's gross domestic product, which was estimated at \$12 billion in 1986 constant dollars. Exports of mineral commodities accounted for about 5.4% of the total export earnings, which were estimated at \$867 million in 1996. Imports of mineral commodities accounted for about 18% of total imports, which were estimated at \$1.5 billion in 1996. Exports of mineral commodities included ores and concentrates of chromium, copper, manganese, tin, tungsten, and zinc; refined lead and silver; and precious and semiprecious stones. Imports of mineral commodities included cement, refined petroleum products, base metals, and steel mill products. Because of increased domestic demand for refined petroleum products, cement and steel mill products, imports of these mineral commodities rose substantially. As a result, Burma was a net importer of mineral commodities in 1996. Most of Burma's mineral trade was with Asian and European countries. Mineral trade with the United States was insignificant and limited to such mineral commodities as precious and semiprecious stones.

The mining industry comprised three State-owned mining enterprises, a State-owned gem enterprise, a State-owned ceramic industries company, a State-owned oil and gas enterprise, several Government and private joint-venture companies, and many small-scale private and local enterprises. Of the total value of the minerals production, 59% was by the

State-owned companies, 40% by the privately owned companies, and 1% by the so-called cooperatives in 1996. The total number of employees in the mining industry was about 116,000, accounting for about 0.7% of Burma's total employment in 1996.

The three State-owned mining enterprises, under the Ministry of Mines, are No. 1 Mining Enterprise (ME 1), No. 2 Mining Enterprise (ME 2), and No. 3 Mining Enterprise (ME 3). ME 1 involved mining and processing of copper, lead, silver, and zinc. ME 2 involved mining, processing, and marketing of diamond, gold, tin, and tungsten. ME 3 involved mining of chromite, coal, industrial minerals, iron, manganese, nickel, and manufacturing of steel and steel mill products. The state-owned Myanmar Gems Enterprise involved mining, processing, and marketing of jade, ruby, sapphire, and other precious and semiprecious stones. The State-owned Ceramic Industries involved manufacturing of cement and other ceramic products. In 1996, several major productive metallic and gemstone mines became a joint-venture operation of the State-owned mining enterprise and privately owned companies or cooperatives.

In an effort to encourage mineral exploration and development and to revitalize its mining industry, the Government enacted the Myanmar Mines Law in 1994. Royalty set by the Government under the 1994 law for various important minerals is as follows: 5% to 7.5% for gemstones, 4% to 5% for gold, platinum-group metals, and silver; 3% to 4% for arsenic, bauxite, bismuth, cadmium, chromium, copper, iron, lead, manganese, nickel, tin, tungsten, and zinc; and 1% to 3% for industrial mineral and stone. However, under the Myanmar Gemstone Law promulgated on September 29, 1995, royalty for diamond, ruby, and sapphire is 20%, and for other gemstones, 10%.

To invest in Burma's mining sector, an application for a permit for mineral prospecting and exploration should be submitted to the Myanmar Investment Commission and the Ministry of Mines for approval. Following discovery of an economically viable mineral deposit, an investor normally would sign a production-sharing joint-venture agreement with the Government or with a local company for participating in development of a new mineral deposit. An investor may also sign a profit-sharing joint-venture agreement with the Government or with a local company for participating in production of minerals at an existing mine or plant.

To attract foreign investment in Burma's mining sector, the Government opened 16 blocks of land in north and north-central Burma in 1994. Fourteen blocks were awarded to 6 foreign companies for exploration of copper, gold, platinum-group

metals, and associated minerals. In 1995, the Government opened 11 blocks of land in central, lower, and upper Burma and awarded 9 blocks to 5 foreign companies for exploration of copper, gold, lead, nickel, platinum-group metals, and zinc. In 1996, the Ministry of Mines, through the Department of Geological Survey and Mineral Exploration (DGSME), signed agreements with three foreign companies to explore for base metals, copper, gold, and platinum-group metals. These foreign companies were Atina Time Square Ltd. and Asia Investment Co. Ltd. of Thailand, and Sum Cheong Exploration (SCE) of Singapore.

In copper mining and processing, ME 1 operated an open pit mine and a mill at No. 1 Copper Mine in the Sabetaung and the Kyisintaung areas in Salingyi Township, about 11 kilometers (km) west of Monywa. The copper ore production averaged about 8,000 metric tons (t) per day and the mill produced about 24,000 t of copper concentrate in 1996. The copper content of the concentrate was between 19% and 20%. To increase productivity and expand capacity of its copper mining and processing operations at No. 1 Copper Mine in the Sabetaung-Kyisintaung areas, the Ministry of Mines, through ME 1, signed a production-sharing contract in April 1996 with Ivanhoe Myanmar Holdings Ltd. (IMH) to establish a 50-50 joint-venture company, called Myanmar-Ivanhoe Copper Co. Ltd., for developing, mining, and processing of copper within the Monywa copper complex, which included the Sabetaung, the Kyisintaung, and the Letpadaung areas. IMH became a wholly owned subsidiary of Vancouver-based Indochina Goldfields Ltd. in 1996.

In March 1996, IMH completed a feasibility study, which called for development of an open pit mine to produce 25,000 metric tons per year (t/yr) of cathode copper using solvent extraction-electrowinning technology with an initial cash operating cost of about \$0.45 per pound from the Sabetaung and the Kyisintaung deposits beginning in the first half of 1998. The estimated ore reserves of the Kyisintaung and the Sabetaung deposits totaled about 130 million metric tons (Mt) of mostly chalcocite ore averaging 0.77% of copper. In 1996, IMH was conducting another feasibility study on the nearby Letpadaung deposit focusing on definition and in-fill diamond drilling to determine the full extent of the Letpadaung deposit. Ore reserves at the Letpadaung deposit were previously estimated by the Ministry of Mines at about 180 Mt averaging 0.66% of copper. However according to Indochina Goldfields, the reserves delineation program in the Letpadaung area has defined minable resources in excess of 300 Mt of ore (Indochina Goldfields Ltd., 1997).

Mine production of lead, silver, and zinc by ME 1 was from the Bawdwin and the Yandanatheingi mines in Shan State and the Bawsaing Mine in Kayah State. Metal production of lead, silver, and byproducts, such as antimonial lead, copper matte, and nickel speiss, by ME 1 was from a lead-silver smelter at Namtu, near the Bawdwin Mine. To improve lead and zinc mining and processing operations, the Ministry of Mines, through ME 1 signed a profit-sharing contract with Mandalay Mining Co. NL (MMC) of Australia in 1996 to conduct a feasibility study on the Bawdwin and Namtu mining and

smelting complex. ME 1 signed a second agreement with MMC in 1996 to explore for lead and zinc in the Mohochaung area, about 50 km northeast of the Bawdwin Mine (U Saw Maung, 1996). In 1996, ME 1 also signed a production-sharing agreement with a local company, Haw Seng Mining Co. for mining lead and zinc in the Nam Lon-Nam Hwme area of Muse Township and the Khomann area of Kutkhai Township in northeastern Burma.

Mine production of gold by ME 2 was from the Kyaukpahtoe Mine in Kawlin Township, Sagaing Division and from the Phayaung Taung in Patheingyi Township, near Mandalay. To expand its gold mining capacity, ME 2 signed a joint-venture agreement with the Newmont Mineral Exploration BV of the United States in July 1996 for exploration, development, and production in Area A and Area B of the Kyaukpahtoe Mine. In 1996, Pacific Arch Exploration NL of Australia (PAE) reported discovery of gold in the Kwinthonese area (Block 13), about 100 km north of Mandalay and identified 13 gold targets in the northern part of its contract area for further exploration. East Asia Gold Corp. of the United States also reported discovery of gold in its contract area of Shante-Getaung (Block 14). In 1996, PAE relinquished its production-sharing contract with ME 2 for development of an alluvial gold deposit near the village of Mansi, about 450 km north of Mandalay because the area's gold-bearing gravel was proven to be subeconomical (South-East Asia Mining Letter, 1996). For the same reason, Sum Cheong Resources Pte. Ltd. of Singapore also terminated its production-sharing contract with ME 2 for renovating the Phayaung Taung gold mine in Patheingyi Township, near Mandalay. In 1996, the Ministry of Mines, through DGSME signed a contract with SCE to explore and conduct a feasibility study for gold in the Mabein area (Block 15) of northern Shan State. In 1996, DGSME also signed contracts with Atina Time Square Ltd. and Asia Investment Co. Ltd. of Thailand to explore and conduct feasibility study for base metals, gold, and platinum-group metals in Burma.

Production of tin and tungsten by ME 2 was mainly from the Mawchi Mine in Phasaung Township of Kayah State and from the Heinda Mine in Tavoy Township of Tanintharyi Division. In 1996, the Heinda Mine was operated by the Yangon Division of Government Employees' Cooperative Ltd. as a joint-venture partner of ME 2 with a production-sharing contract. Production of diamond by ME 2 was from the Theindaw Mine in Tanintharyi Division, where small-size, gem-quality diamonds were recovered as a byproduct of sluicing tin concentrate. Production of industrial minerals, such as barite, bentonite, clays, dolomite, feldspar, gypsum, limestone, and salt from various parts of the country was mostly for domestic consumption. However, production of diamond was mostly for export.

Production of cement was by the State-owned Myanmar Ceramic Industries, which operated three cement plants. Cement plant No. 1, at Thayet in Magway Division, had a capacity of 270,000 t/yr in 1996. Cement plant No. 2, in Kyangin Township of Ayeyarwady Division, had a capacity of about 320,000 t/yr. Cement plant No. 3, at Hpa-an Township of Kayah State, had a capacity of 240,000 t/yr. Because of the

growing demand for cement, production of cement remained at a high level in 1996. The high level of construction activity, mainly building hotels in the Rangoon and Mandalay areas, had resulted in record-high imports of cement in 1996.

The State-owned Myanma Gems Enterprise operated gem mines at the Mogok Stone Tract for rubies and sapphires and at the Jade Mines area for jade. Since 1993, both the State-owned enterprise and private companies have participated in ruby and jade mining at the Mongshu Stone Tract in eastern Burma. At the Mongshu gemstone tract, high-quality rubies and lower quality rubies containing iron had been discovered recently. In 1996 most of the jade mining were at the Lonkhin, Phakant, Myitkyina, and Hkamti areas. At the Pyinlon (Nawarat) Stone Tract in northern Burma near the Chinese border and at Nathmaw and Manshibon in northwestern Burma, high-quality jade also had been discovered recently. Myanma Gems Enterprise held its 33d gem, jade, and pearl emporium in March 1996, at the Myanma Gems Emporium Hall on Kaba-Aye Pagoda Road, Yangon. It had a total sales of \$19.2 million, of which \$4.9 million was from sales of gemstones, \$11.9 million was from jade, and \$2.4 million was from pearl. At the Gem Emporium, about \$3.1 million of jewelry and jade carvings also were sold. The gems industry was one of Burma's major foreign exchange earners.

Production of coal was by ME 3 from the Namma open pit mine in Shan State and from the Kalewa underground mine in Sagain Division. The Namma Mine produced about 25,000 t of lignite-grade coal. The Kalewa Mine produced about 13,000 t of subbituminous-grade coal. In 1996, ME 3 was negotiating with the Malaysian Mining Corp. for a production-sharing joint-venture agreement to operate the Kalewa coal mine. Coal reserves at the Kalewa Mine were estimated at 40 Mt with coal resources of up to 128 Mt. In 1996, ME 3 signed a production-sharing agreement with Myanmar BPL Resources Ltd. for production of granite in the Bantbwegon area of Paung Township, Mon State. Myanmar BPL Resources is a joint-venture firm of Rocky Myanmar Ltd. and Bored Piling Pte Ltd. of Singapore (Myanmar Business, 1996).

Production of crude petroleum and natural gas was by the State-owned Myanma Oil and Gas Enterprise (MOGE), which operated 17 onshore oilfields and gasfields. Production of natural gas from 23 wells in the Aphyauk Gasfield, between Taikkyi Township in Yangon Division and Zalun Township in Ayeyarwady Division, reached 4.5 million cubic meters per day in 1996, natural gas wells at the Aphyauk Gasfield also produced between 120 barrels per day (bbl/d) and 150 bbl/d of condensate. In 1996, six additional test wells were drilled in Myaing Township of Pakokku District, Magwe Division. After the production of natural gas from those six wells reached 311,000 cubic meters per day, the Ministry of Energy, named the gasfield the Kyaukhwet-Letpanto Gasfield in 1996. Most of the natural gas produced from the Aphyauk Gasfield was piped to Yangon and Pyay for power generation at Thaketa, near Yangon; and at Shwedaung, near Pyay; and for industrial use at the Sittaung Paper Mill and fertilizer plants in Yangon.

In 1996, Myanmar Total Exploration and Production Co. (MTEP) drilled six exploratory wells in Moattama concession Blocks M-5 and M-6 offshore in Martaban Gulf and found a commercial scale of oil and gas in four wells (Petroleum Economist, 1996). MTEP is a joint venture of Total Oil Co. of France (36.75%), Unocal Oil Co. of the United States (33.25%), and Petroleum Authority of Thailand (30%). Atlantic Richfield Company (ARCO) of the United States, through its subsidiary ARCO Myanmar Inc., signed a second offshore production-sharing agreement with MOGE in 1996 for exploring natural gas in Block M-9. ARCO signed its first contract with MOGE for natural gas exploration in Block M-7 in 1995 (Myanmar Business, 1996).

The Ministry of Energy signed a memorandum of understanding with a consortium of Mitsui & Co. of Japan, Total SA of France, and Unocal of the United States in April 1996 to be the joint-venture partners in the \$700 million Yadana natural gas utilization project (The Wall Street Journal, 1996). Under the agreement, the consortium was granted exclusive rights to negotiate commercial and industrial use of natural gas produced from the offshore Yadana field. The natural gas utilization project involved building a 250-km gas pipeline, a powerplant, and a nitrogen fertilizer complex.

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Major Sources of Information

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Major Publications

The Ministry of National Planning and Economic Development,
Central Statistical Organization: Statistical Abstract, annually;
Selected Monthly Economic Indicators, 1996.

TABLE 1
BURMA: PRODUCTION OF MINERAL COMMODITIES 1/

(Metric tons unless otherwise specified)

Commodity 2/	1992	1993	1994	1995	1996 e/
METALS					
Chromium: Chromite, gross weight e/	6,200	1,000	1,000	1,000 r/	1,000
Copper:					
Mine output, Cu content	3,731	3,581	5,025	5,282 r/	5,500
Matte, gross weight	45	42	37	199 r/	200
Gold, mine output, Au content e/ kilograms	48	63	70	90	100
Iron and steel: 3/					
Pig iron	899 r/	1,000 r/	1,188 r/	1,500 e/	1,500
Steel, crude	10,200 r/	11,400 r/	16,500 r/	23,500 r/	25,000
Lead					
Mine output, Pb content e/	2,800	2,200	2,300	2,400	2,500
Metal:					
Refined	2,122	1,561	1,797	1,753	1,800
Antimonial lead (93% Pb)	71	38	40	-- r/	40
Manganese mine output, Mn content e/	49	43	60	50	50
Nickel:					
Mine output, Ni content e/	9	67	50	50	50
Speiss (matte), gross weight	35	259	74	81 r/	100
Silver, mine output, Ag content kilograms	4,790	2,395	5,629	4,417 r/	3,900
Tin, mine output, Sn content:					
Of tin concentrate	214	314	416	372	170
Of tin-tungsten concentrate	435	375	398	375	250
Total	649	689	814	747	420
Meta, refined	189	170	200	190 e/	100
Tungsten, mine output, W content:					
Of tungsten concentrate	35	70	89	93	40
Of tin-tungsten concentrate	496	454	455	438	300
Total	531	524	548	531	340
Zinc, mine output, Zn content	1,078	850	1,316	721 r/	590
INDUSTRIAL MINERALS					
Barite	13,589	15,628	21,969	34,601	26,000
Cement, hydraulic	464,495	400,031	469,582	516,931	515,000
Clays:					
Ball clay	230	255	--	--	--
Bentonite	693	200	795	2,655 r/	2,600
Fire clay and fire clay powder	1,500	2,154	2,413	2,735 r/	2,800
Feldspar 3/	1,376 r/	5,728 r/	5,605 r/	8,749 r/	9,000
Gypsum	30,933	27,835	38,136	34,659	38,000
Nitrogen: N content of fertilizer e/	130,000	130,000	130,000	130,000	130,000
Precious and semiprecious stones:					
Jade kilograms	162,964	223,980	316,543	702,751	1,350,000
Diamond carats	252	169	48	10	10
Rubies, sapphires, spinel do.	243,109	254,753	185,418	2,725,038 r/	7,575,000
Salt e/ 4/ thousand tons	260	260	260	260	260
Stone:					
Dolomite	2,100	1,248	4,115	3,432	4,700
Limestone, crushed and broken 3/ thousand tons	2,093 r/	2,154 r/	2,581 r/	3,008 r/	3,000
MINERAL FUELS AND RELATED MATERIALS					
Coal, lignite	33,573	31,654	35,856	32,191	35,000
Gas, natural:					
Gross e/ million cubic meters	913	1,054	1,329 r/	1,508 r/	1,640
Marketed do.	894	1,031	1,301 r/	1,477 r/	1,600
Petroleum:					
Crude thousand 42-gallon barrels	5,497	5,205	5,188	4,393	4,000
Refinery products 5/ do.	4,395	4,516	4,627	5,313	5,400

e/ Estimated. r/ Revised.

1/ Table includes data available through May 2, 1997.

2/ In addition to the commodities listed, pottery clay, silica sand, construction aggregate, and varieties of gemstones are produced, but available information is inadequate to make reliable estimates of output levels.

3/ Data are for fiscal year ending Mar. 31 of that year.

4/ Brine salt production (in metric tons) reported by the Government was: 1992--46,509; 1993--58,915; 1994--58,612; 1995--81,156; and 1996--75,000 (estimated).

5/ Includes gasoline, jet fuel, kerosene, diesel, distillate fuel oil, and residual fuel oil.

Source: Ministry of Mines and Central Statistical Organization (Yangon), Statistical Abstract 1995, p. 147; Statistical Abstract 1996, pp. 41-42; and Selected Monthly Economic Indicator, July-Aug. 1996, p. 11, p. 15, pp. 16-17, and pp. 20-22.