

THE MINERAL INDUSTRY OF BURMA (MYANMAR)

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Myanmar, formerly known as Burma, has large mineral resources of precious and semiprecious stones, such as jade, ruby, and sapphire. Myanmar also has considerable mineral resources of antimony, barite, coal, copper, gold, iron, lead, monazite, natural gas, nickel, petroleum, silver, tin, tungsten, and zinc. Myanmar's known mineral resources of bauxite, bentonite, beryllium, clays, chromium, diamond, feldspar, fluor spar, gypsum, kaolin, manganese, mercury, mica, platinum, and sulfur are small (Ko Ko Myint, 1994). The potential for discovering more mineral deposits or extending reserves of identified mineral resources is, however, good, because about 43% of the country has not yet been geologically mapped and explored.

To attract more foreign investment in Myanmar's mining sector, the Ministry of Mines opened 12 additional blocks of land covering an area of 1,400 square kilometers (km²) for minerals prospecting and exploration following the first round of bidding for 16 blocks in 1994 and the second round for 11 blocks in 1995. Bidding for the 12 blocks for exploration for copper, gold, lead, nickel, silver, and zinc expired on September 16, 1997 (Myanmar Business, 1997c).

In 1997, 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. (*See table 1.*)

In 1997, the output of the mining sector contributed about 1.7% to Myanmar's gross domestic product. Exports of mineral commodities accounted for about 5% of the total export earnings and imports of mineral commodities accounted for about 20% of total imports. Exports of mineral commodities included ores and concentrates of chromium, copper, manganese, tin, tungsten, and zinc; refined metal of lead, silver, and tin; and crude and polished precious and semiprecious stones. Imports of mineral commodities included cement, refined petroleum products, base metals, and steel mill products. In 1997, imports of refined petroleum products, cement, and steel mill products were higher than those of 1996 because of a stronger demand for these mineral commodities. As a result, Myanmar was a net importer of mineral commodities. Most of Myanmar's mineral trade was with Asian and European countries. Mineral trade with the United States was small and limited to imports of various chemicals compounds from the United States and exports of gemstones to the United States. In July, Myanmar became a member of the Association of Southeast Asian Nations and is expected to have closer economic relations with other members in the coming years.

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. The total number of employees

in the mining industry was about 120,000, accounting for about 0.8% of Myanmar's total employment.

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). Under ME 1, copper, lead, silver, and zinc were mined and processed. Under ME 2, diamond, gold, tin, and tungsten were mined, processed, and marketed. Under ME 3, chromite, coal, industrial minerals, iron, manganese, nickel were mined, and steel and steel mill products were manufactured. The state-owned Myanma Gems Enterprise (MGE) involved the mining, processing, and marketing of jade, ruby, sapphire, and other precious and semiprecious stones. The state-owned Ceramic Industries involved the manufacturing of cement and other ceramic products. In the past 3 years, the Government had partially privatized several state-owned productive metallic and gemstone mines and formed several new joint-venture companies or cooperatives with local and foreign companies for mining and mineral processing.

In copper mining and milling, ME 1 operated an open-pit mine and a mill at No. 1 Copper Mine in the Sabetaung and the Kysisintaung areas in Salingyi Township, about 11 kilometers (km) west of Monywa in central Myanmar. In 1997, production of copper concentrate from the mine was estimated to be about 30,000 metric tons containing about 20% copper. Indochina Goldfields Ltd., through its subsidiary, the British Virgin Islands-based Ivanhoe Myanmar Holdings, formed a joint venture with ME 1, called Myanmar Ivanhoe Copper Co. Ltd., and in its Phase I copper project, began development of an open-pit mine to produce 25,000 metric tons per year (t/yr) of copper cathode using solvent extraction-electrowinning (SX-EW) technology from the Sabetaung and the Kysisintaung deposits by mid-1998. Indochina Goldfields had signed contracts for financing and construction of the new plant and a contract for marketing of copper cathodes in 1997. Indochina Goldfields planned to expand the production capacity of copper cathode to 63,500 t/yr in Phase II with an additional cost of about \$300 million (Mining Journal, 1997).

According to Indochina Goldfields, a pilot plant near the Sabetaung deposit was producing 1 metric ton per day of copper cathode using the SX-EW process. Construction works on an open-pit mine and a 25,000-t/yr processing plant at the mine site were progressing according schedule in 1997. The copper cathode produced by the plant will have the purity of 99.999% copper and a cash operating cost of about \$0.48 per pound, or about \$1.06 per kilogram. The minable reserves at the Sabetaung deposit were raised to 55.1 million metric tons (Mt) grading 0.48% copper at a 0.15% cutoff grade from 27.1 Mt grading 0.609% copper at a 0.15% cutoff grade in 1997 after pit optimization work was completed by Resources Service Group of Australia. The total minable reserves at the existing Sabetaung pit, the satellite Sabetaung South deposit,

and the adjacent Kyisintaung deposit were estimated at 155 Mt grading 0.47% copper at a 0.15% cutoff grade (Indochina Goldfields Ltd., 1998).

Mine production of lead, silver, and zinc by ME 1 was from the Bawdwin Mine and the Yandanatheingi Mine 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. In 1997, ME 1 signed a production-sharing contract with Tarfu Mining Co., Ltd., for exploration of lead and zinc in Panlon region, Hopang Township, in northern Shan State (Myanmar Business, 1997b).

Mine production of gold by ME 2 was from the Kyaukpahtoe Mine in Kawlin Township, Sagaing Division and from the Phayaungtaung Mine in Patheingyi Township, near Mandalay. In January, ME 2 and Holy S. Pin Co. Ltd. of Kachin Special Region 1 signed a profit-sharing contract for gold production at the Malikha and the Maykha Rivers, about 64 km north of Myitkyina in Kachin State. The contract was the first ME2 joint-venture agreement signed with a local company since Myanmar opened its country land for minerals exploration in 1994 (Myanmar Business, 1997a). In February, the Ministry of Mines, through its Department of Geological Survey and Exploration, signed a contract with Terrace Gold NL, a subsidiary of Australian Kimberley Mines NL, to conduct exploration and a feasibility study for developing gold deposits in the Kalaw area of Shan State. In May, ME 2 also signed a contract with Sea Sun Star Co. Ltd., another local company in Kachin, to explore jointly for gold along the Ayeyawady River in Mankhein region in Myitkyina Township. In April, First Dynasty Mines Ltd. reported discovery of gold at Naungpat Ridge, near the center of Block 2 in north-central Myanmar (Engineering and Mining Journal, 1997).

Production of tin and tungsten by ME 2 was mainly from the Mawchi Mine in Phasaung Township of Kayah State and the Heinda Mine in Tavoy Township of Tanintharyi Division. Production of diamond by ME 2 was from the Theindaw tin mine in Tanintharyi Division, where small-sized, 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.

Production of cement was by the state-owned Myanma Ceramic Industries, which operated three cement plants. Cement plant No. 1, at Thayet in Magway Division, had a capacity of 270,000 t/yr. 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. To meet the growing domestic demand for cement, a joint-venture firm to build a \$210-million cement plant in Thilawa Industrial Estate was established by Myanmar Cement Co. (MCC) and P.T. Semen Cibinon of Indonesia in 1997. Construction of the plant was started in mid-1997 and was expected to be operational in 2000 with a capacity of 2.5 million metric tons per year. MCC also planned to establish a joint-venture firm with P.T. Tirtamas Onada Engineering Co. of Indonesia to build a 960,000-t/yr clinker plant and a 300,000-t/yr cement plant in Pyadong (Myanmar Business, 1997e).

MGE mined for rubies and sapphires at the Mogok Stone Tract and for jade at the Jade Mines area. Since 1993, the state-owned enterprise and local private companies have participated in jade and ruby mining at the Mongshu Stone Tract in eastern Myanmar. Most

of the high-quality jade was produced from the Phakant Mine and the Tawmaw Mine located in Kachin State in northern Myanmar. According to the Ministry of Mines, most of MGE's productive jade and gemstone mines had been taken over by the Union of Myanmar Economic Holdings Ltd. for mining and marketing, and the less productive jade and gemstone mines were operated by joint ventures of private local companies and MGE during the last 2 years (Mining Annual Review, 1997).

Production of crude petroleum and natural gas was by the State-owned Myanma Oil and Gas Enterprise (MOGE). Production of crude petroleum, averaging 12,200 barrels per day (bbl/d) in 1997, was mainly from five onshore oil fields—Chauk-Lanywa, Mann, Myanaung, Prome, and Yenangyaung. All crude petroleum production was refined by two refineries operated by the state-owned Myanmar Petro-Chemical at the 25,000-bbl/d Thanlyin Refinery, near Yangon (Rangoon), and at the 5,000-bbl/d Chauk Refinery, near the Chauk-Lawtwa Oilfield (Mya Nu Aye, Myanmar oil and gas production, accessed May 4, 1998, at URL <http://www.myanmar.com/gov/perspec/11-97/oil11-97.htm>).

Production of natural gas, averaging 4.85 million cubic meters per day (Mm³/d) in 1997, was mainly from 23 wells in the Aphyauk Gasfield, about 72 km northwest of Yangon, between Taikkyi Township in Yangon Division and Zalun Township in Ayeyarwady Division. Most of the natural gas production from the Aphyauk Gasfield was piped to two powerplants for the generation of electricity at Thaketa, near Yangon and Shwedaung, near Pyay, and for industrial use at the Sittaung Paper Mill and nitrogen fertilizer (ammonia and urea) plants at Kyawswa, Kyunchaung, and Sale near Yangon.

In oil and gas exploration and development, MOGE signed a production-sharing contract with Total Myanmar Exploration and Production Ltd. of France (52.5%) and Unocal Myanmar Offshore Co., Ltd., of the United States (47.5%) in January 1997 for oil and gas exploration in the 11,068-km² Block M-8, southwest of Blocks M-5 and M-6, where the country's largest offshore gasfield, Yadana Gasfield is located. Total and Unocal are joint-venture partners in the \$1.2 billion Yadana Gasfield project to deliver 80% of its output, or at the rate of 14.87 Mm³/d, to Thailand beginning in July 1998 via a 450-km pipeline, which was under construction in 1997 (Myanmar Business, 1997d). In development of Block M-12, the country's second largest offshore gasfield, Yetagun Gasfield, Texaco Exploration Myanmar Inc. (TEMI) awarded a \$110 million engineering contract to Sembawang Marine & Offshore Engineering (SMOE) of Singapore for the platform engineering services and to SMOE's partner, Saipem of the United Kingdom, for the gas production platform transportation and installation in the Andaman Sea offshore from Dawei (Myanmar Business, 1997a). According to Far Eastern Economic Review (1997), Texaco Oil Co. of the United States, sold its 42.9% stake in the Yetagun Gasfield project to Premier Oil of the United Kingdom, one of Texaco's partners in TEMI, for \$260 million in October. In November, Petronas Carigali Sdn. Bhd., a subsidiary of the Malaysian state-owned national oil and gas company, agreed to acquire 36.6% from Premier Oil. Other partners in the Yetagun Gasfield project were Nippon Oil Co. of Japan, Petroleum Authority of Thailand, and Amerada Hess Corp. of the United States (Myanmar Business, 1997f).

In line with its program to improve oil recovery and reactivation of suspended oilfields, MOGE signed contracts in 1997 to increase crude petroleum production from onshore oilfields using foreign

newcapital investment and technology with APN Petroleum Co. and P.T. Easpan Sumatra of Indonesia, Baker Hughes of the United States, Midland Scottish Resources Co. of the United Kingdom, Asia Pacific Energy Co. of Hong Kong, Pacrim Energy NL of Australia, and American Tile South East Asia Co. of Canada. In April, ARCO Myanmar Inc., a subsidiary of Atlantic Richfield Co. of the United States reported a new gas discovery in its Block M-9 offshore tested 708,000 cubic meters per day (World Oil, 1997).

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Major Source of Information

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Major Publication

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

TABLE 1
BURMA: PRODUCTION OF MINERAL COMMODITIES 1/

(Metric tons unless otherwise specified)

Commodity 2/ METALS	1993	1994	1995	1996 p/	1997 e/
Chromium, chromite, gross weight e/	1,000	1,000	1,000	1,000	1,000
Copper:					
Mine output, Cu content	3,581	5,025	5,282	5,000 r/ e/	6,000
Matte, gross weight	42	37	199	100 r/ e/	200
Gold, mine output, Au content e/ kilograms	63	70	90	160 r/	100
Iron and steel: 3/					
Pig iron	1,000	1,188	1,500 e/	1,500 e/	1,500
Steel, crude	11,400	16,500	23,500	25,000 e/	25,000
Lead					
Mine output, Pb content e/	2,200	2,300	2,400	2,200 r/	2,800
Metal:					
Refined	1,561	1,797	1,753	1,984 r/	2,000
Antimonial lead (93% Pb)	38	40	--	40 e/	30
Manganese, mine output, Mn content e/	43	60	50	50	50
Nickel:					
Mine output, Ni content e/	67	50	50	50	50
Speiss (matte), gross weight	259	74	81	30 r/ e/	100
Silver, mine output, Ag content kilograms	2,395	5,629	4,417	3,950 r/	2,000
Tin, mine output, Sn content:					
Of tin concentrate	314	416	372	201 r/	160
Of tin-tungsten concentrate	375	398	375	258 r/	240
Total	689	814	747	459 r/	400
Metal, refined	170	200	190 e/	-- r/	--
Tungsten, mine output, W content:					
Of tungsten concentrate	70	89	93	33 r/	30
Of tin-tungsten concentrate	454	455	438	301 r/	250
Total	524	544 r/	531	334 r/	280
Zinc, mine output, Zn content	850	1,316	721	572 r/	400
INDUSTRIAL MINERALS					
Barite	15,628	21,969	34,601	24,679 r/	22,000
Cement, hydraulic	400,031	469,582	516,931	504,670 r/	530,000
Clays:					
Ball clay	255	--	--	--	--
Bentonite	200	795	2,655	2,600 e/	2,500
Fire clay and fire clay powder	2,154	2,413	2,735	2,800 e/	2,600
Feldspar 3/	5,728	5,605	8,749	9,000 e/	8,000
Gypsum	27,835	38,136	34,659	37,899 r/	39,000
Nitrogen, N content of fertilizer e/	130,000	130,000	130,000	130,000	130,000
Precious and semiprecious stones:					
Jade kilograms	223,980	316,543	702,751	1,214,711 r/	1,400,000
Diamond carats	169	48	10	45 r/ e/	10
Rubies, sapphires, spinel do.	254,753	185,418	2,725,038	6,858,298 r/	7,600,000
Salt e/ 4/ thousand tons	30 r/	30 r/	35 r/	35 r/	35
Stone:					
Dolomite	1,248	4,115	3,432	5,147 r/	5,000
Limestone, crushed and broken thousand tons	2,154	2,581	3,008	3,000 e/	3,500
MINERAL FUELS AND RELATED MATERIALS					
Coal, lignite	31,654	35,856	32,191	33,407 r/	45,000
Gas, natural:					
Gross e/ million cubic meters	1,054	1,329	1,508	1,659 r/	1,770
Marketed do.	1,031	1,301	1,477	1,625 r/	1,700
Petroleum:					
Crude thousand 42-gallon barrels	5,205	5,188	4,393	3,906 r/	4,500
Refinery products 5/ do.	4,516	4,627	5,313	4,831 r/	5,500

e/ Estimated. p/ Preliminary. r/ Revised.

1/ Table includes data available through May 13, 1998.

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 March 31 of that year.

4/ Brine salt production, in metric tons, reported by the Government was: 1993--58,915; 1994--58,612; 1995--81,156; 1996--71,350; and 1997--70,000 (estimated).

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

Sources: Ministry of Mines and Central Statistical Organization (Yangon), Statistical Abstract 1995, p. 147; Statistical Abstract 1996, p. 41-42; and Selected Monthly Economic Indicator, November-December 1996, p. 11, p. 16-17, and p. 20-22.