

THE MINERAL INDUSTRY OF MALAYSIA

By John C. Wu

Malaysia's resources of tin are large. Its resources of ilmenite, monazite, thorium, xenotime, and zirconium associated with tin are fairly rich, but not large. Malaysia also has considerable resources of antimony, barite, bauxite, clays, coal, copper, gold, iron ore, lead, limestone, natural gas, crude petroleum, silica, silver, tungsten, and zinc. Based on favorable preliminary geological surveys previously conducted by the Government of Malaysia, the potential for discovering additional resources of clays, coal, copper, gold, lead, silver, tin, and zinc in the States of Kelantan, Pahang, Sabah, Sarawak, and Terengganu is good (Geological Survey Department, Malaysia, 1996c).

In 1997, Malaysia's minerals production included barite, bauxite, coal, copper, dolomite, feldspar, gold, ilmenite, iron ore, kaolin, limestone, mica, monazite, natural gas, crude petroleum, sand and gravel, silica, silver, tin, and zirconium. Malaysia's production of important value-added minerals was cement, liquefied natural gas (LNG), nitrogen fertilizer materials (ammonia and urea), refined petroleum products, crude steel, titanium dioxide pigment, and refined tin. (*See table 1.*) In 1997, Malaysia was the third largest producer and exporter of refined tin and LNG in the world. Malaysia also was one of the important producers and suppliers of bauxite, copper, ilmenite, kaolin, monazite, and crude petroleum in Asia and the Pacific region.

The mining industry, which contributed 6.8% to Malaysia's gross domestic product (GDP), continued to grow in 1997 but at a slower pace than that of 1996 because of a smaller increase in the production of natural gas. The output of the mining sector grew by 2.8% compared with 4.5% in 1996. Malaysia's GDP also grew moderately at 8% compared with 8.6% in 1996 because of a slower pace of economic activities, especially in the construction and manufacturing sectors caused by the currency crisis in Southeast Asian countries in the second half of 1997. Malaysia's GDP, in 1978 constant dollars, was estimated to be \$50.2 billion, of which \$3.4 billion was contributed by the mining sector in 1997 (Ministry of Finance, Malaysian economy in 1997, accessed June 1, 1998, at URL <http://www.treasury.gov.my/budget/htdoc/rconreport/economy/frames1.htm>).

In 1997, Malaysia remained a net exporter of mineral products. Most of which went to Japan and neighboring Southeast Asian countries. Bauxite was exported mainly to Japan and the United States. All copper concentrate was exported to Japan. Ilmenite was exported mainly to France, Japan, and the Republic of Korea. Refined tin was exported mainly to the Republic of Korea, Japan, the Netherlands, Taiwan, and the United Kingdom. LNG and crude petroleum were exported mainly to the Republic of Korea and Japan. Malaysia was a minor supplier of bauxite, crude petroleum, and refined tin to the United States.

According to Malaysia's Department of Statistics, total export earnings were \$78.7 billion, of which about \$2.5 billion was from

exports of crude petroleum and about \$2.3 billion was from exports of natural gas (in the form of LNG). The export earnings from refined tin were about \$170 million; copper concentrate, \$45 million; and other minerals, including bauxite, clays, ilmenite, iron ore, kaolin, monazite, silica, and zircon concentrate, totaled about \$28 million. The imports of iron ore and tin concentrates, mostly for reexport after smelting, totaled about \$250 million. Imports of coal, gypsum, phosphate rock, and potash, mostly for domestic consumption, totaled about \$190 million. Malaysia also imported about 40,000 barrels per day (bbl/d) of heavy crude petroleum from the Middle East to meet the requirement for its domestic oil refineries.

The structure of Malaysia's mineral industry expanded further in 1997. The capacity of the cement industry increased to 16.7 million metric tons per year (Mt/yr) and that of the LNG industry, which was raised to 15.9 Mt/yr in 1996, was undertaking another expansion program to raise its LNG production capacity by 6.8 Mt/yr by 2001. Production capacity of natural gas also expanded substantially, especially in the oilfields and gasfields offshore Sarawak and Terengganu. (*See table 2.*) According to Malaysia's Department of Statistics, the total number of persons employed by the mining and quarrying industries increased to 43,900, accounting for 0.5% of Malaysia's labor force in 1997 from 42,600 in 1996. Malaysia's labor force rose to 8.6 million in 1997 from 8.4 million in 1996.

Exploration and development activities in most of the nonfuel minerals remained slow in 1997, but there was active exploration for and development of gold, natural gas, and oil. As a result, reserves and production capacity had been raised in gold and natural gas. Mine production of copper and tin declined because of high production costs and low metal prices. Production of industrial minerals for building materials also decreased owing to a slower growth in the construction sector. Production of bauxite and gold, however, rose considerably because of increased number of operating mines in 1997. Production of natural gas also increased because of increased capacity and stronger overseas demand.

In the metallic minerals sector, mine production of bauxite was by Johore Mining and Stevedoring Co. Sdn. Bhd., which operated three open-pit mines in the Sungei Rengit area of Pengerang. The company also operated a processing plant with a capacity of 400,000 metric tons per year (t/yr) of washed bauxite at the Bukit Raja area near Pengerang Highway, north of Sungai Rengit and east of Johore Bahru. The company produced three grades of bauxite—chemical, refractory, and cement. Most of the chemical- and refractory-grade bauxite was exported to Japan and the United States, and the cement-grade bauxite was sold to domestic cement manufacturers. Despite increased production and the increased number of operating mines, the total number of workers decreased from 155 in early 1997 to 110 by the end of the year.

Mine production of copper by the Mamut Copper Mining Sdn.

Bhd. (MCM) at the Mamut Mine near Ranau in Sabah decreased from that of 1996 because of decreasing ore-grade and depleting ore reserves. Production of copper concentrate decreased by 7.9% to 80,675 metric tons in 1997 from that of 1996. The average metal content of the copper concentrate was about 23% copper in 1997. All copper concentrate was transported by truck to Usukan Port in Kola Belud, about 115 kilometers (km) from the mine site, then loaded onto bulk carriers for export to Japan. At the end of 1997, the company employed 1,050 workers. The company has a comprehensive plan to convert the mine site into an integrated tourist resort after the year 2000 when the ore reserves are depleted and mining operations cease.

Mine production of gold rose sharply in 1997 because of the increased number of the productive mines operating in the States of Kelantan, Pahang, Sarawak, and Terengganu, despite reduced gold production as a byproduct of copper mining at the Mamut Mine in Sabah. Of the total gold produced in 1997, 79.2% was from primary gold mines, and 21% was a byproduct of copper mining in Sabah and tin mining in the State of Perak and Selangor.

Avocet Mining PLC of the United Kingdom, through its subsidiary Avocet Venture Inc. of Canada, in joint venture with Pahang State Development Corp., began gold mining operations at the Penjom Gold mine in the Ampang Jaleh area of central Pahang in December 1996. By September 1997, the treatment plant had produced about 1,275 kilograms (kg) of gold at a cash cost, including royalties, of \$6,301.54 per kilograms or \$196 per troy ounce. The plant throughput was 400,000 t/yr of mainly oxide ore at a feed grade of 3.5 grams per metric ton (g/t) of gold with a recovery rate of 91%. Ore reserves at the Penjom property, estimated by the company at the end of September 1997, were 3.94 million metric tons (Mt), averaging 3.49 g/t of gold (Avocet Mining PLC, 1997). According to the company, gold production for the fiscal year ending March 31, 1998, was expected to be about 2,022 kg, which was slightly lower than the planned production because of lower gold recoveries caused by the problems associated with the treatment of the carbonaceous ores. The ore treatment plant, however, was being further modified, which included the upgrade of the gravity circuit and the desliming plant to process carbonaceous ore. The company expected the modified treatment plant to be fully operational by mid-1998 with higher grade ores, lower waste striping, and lower mining and treatment costs (Avocet Mining PLC, 1998). According to the Government of Pahang, the Penjom gold project employed about 200 workers.

According to Malaysia's Geological Survey, several new gold mines were expected to begin operations mainly in the Raub District of Pahang and the Bau District of Sarawak by 1998. Raub Australian Gold Sdn. Bhd., a joint venture of Akay Holding Sdn. Bhd. and Well Gold Corp N.L of Australia, will operate the Bukit Koman Mine; Damar Sdn. Bhd. will operate the Sungai Selinsing Mine; and TRA Mining (M) Sdn. Bhd. will operate Sungai Koyan Mines, all in the State of Pahang. In addition, Gladioli Enterprise Sdn. Bhd., Southern Gold Mining Development Sdn. Bhd., and Syarikat Tabai Sdn. Bhd. will begin their gold mining operation in the Bau District (Geological Survey Department, Malaysia, 1996a).

Production of iron ore decreased considerably in 1997. Iron ore production was from six operating mines in the States of Johor, Kedah, Pahang, and Perak. A small quantity of iron ore, however, was recovered as a byproduct of tin mining in 1997. According to Malaysia's Department of Mines, the iron ore production in 1997

had an average grade of 64% iron. All iron ore production was consumed domestically by Malayawate Steel Bhd. and several cement companies. To meet the raw material requirements for its iron and steel industry, Malaysia imported about 1.8 Mt/yr of iron ore and concentrates, about 180,000 t/yr of pig iron, about 62,000 t/yr of ferroalloys, and about 1.1 Mt/yr of iron and steel scrap. Imported iron ore and concentrates were consumed by two direct-reduction iron plants operated by the State-owned Perwaja Steel Sdn. Bhd. (PS) in Kemaman, Terengganu, and Sabah Gas Industries on Labuan Island, offshore Sabah. Pig iron and iron and steel scrap were consumed by PS and other major producers of steel billet in Peninsular Malaysia.

PS, Malaysia's only integrated steel producer, brought on-stream Malaysia's first beam and section steel mill with a capacity of 700,000 t/yr of steel beams, angles, and channels at Gurun, near the Butterworth-Penang port on May 13. To revitalize the financially troubled PS, the Government announced at the opening ceremony of the Gurun plant that PS would be privatized with Maju Holdings Sdn. Bhd. to hold 51%; the Lion Group, 30%; the State Government of Terengganu, 5%; and the remaining 14% to the Federal Government. On May 20, Maju Holdings had agreed to purchase 51% of PS equity. The Lion Group reportedly, however, had not taken its share. Because the Government was to absorb all PS's accumulated losses of about \$1 billion and total debt of about \$2.5 billion, the Federal Government would then retain 49% of PS equity if the Lion Group declined the offer (Far Eastern Economic Review, 1997).

Malaysia's tin mining industry remained depressed. Because of low tin prices and depleting reserves of high-grade ores at the operating tin mines, the output of tin dropped to a record low in 1997. The average price of tin on the Kuala Lumpur Tin Market (KLTM) dropped from 14.52 Malaysian ringgits per kilogram in January to 13.80 ringgits per kilogram in July and then rebounded to about 21 ringgits per kilogram in December. The continued depreciation of the ringgit against the U.S. dollar triggered waves of panic buying on the KLTM. As a result, the average price of tin steadily moved up in the last quarter of 1997 to about 21 ringgits per kilogram by December 2 (Mining Journal, 1997). Despite the strong recovery of tin prices in the last quarter of 1997, the tin price on KLTM averaged 15.31 ringgits per kilogram, still lower than the 1996 average of 15.35 ringgits per kilogram.

According to the Department of Mines, the total number of operating tin mines decreased by 1 to 36 in 1997. Of the total tin produced in 1997, 41% was by gravel pumping, and the rest, by dredging, open-pit mining, panning, and underground mining. The tin mining industry's labor force averaged 1,854 for the first 9 months of 1997 compared with 1,914 for the same period in 1996. To supplement the short fall of domestically produced tin ore and concentrate for the raw material requirements for its tin smelters, Malaysia imported about 30,556 t of tin in concentrates mainly from Australia, Bolivia, China, Indonesia, Peru, Portugal, Russia, and several African countries.

Production of refined tin was by Escoc Smelting Sdn. Bhd. and Malaysia Smelting Corp. Bhd. At the Escoc Smelting in George Town on the island of Penang, the actual capacity was 20,000 metric tons per year. The smelter's intake was about 22,000 t of tin concentrate, of which about 90% was met by the low-grade imported ore. Domestic tin concentrate, which averaged 75% tin, accounted for less than 10% of the smelter requirements. Tin content of

imported concentrates averaged 55% tin. Escoy Smelting imported its tin concentrates from Australia, Nigeria, Peru, Portugal, Russia, and the United Kingdom. The smelter produced 10,534 t of refined tin in 1997 compared with 14,482 t in 1996. Escoy Smelter announced in late 1997 that it would cease operations of its tin smelter in George Town in early 1998 and transfer its operations to a newly acquired tin smelter in Phuket, Thailand.

At the Malaysia Smelting in Butterworth across the channel from George Town, the actual capacity was 40,000 metric tons per year (t/yr). The smelter's intake was about 42,000 t of tin concentrate, of which 85% was met by imported ore. Tin contained in imported tin concentrate averaged 55%. After blending with the domestic tin concentrate, the average tin content of the smelter's feed was 61% tin. Malaysia Smelting imported tin concentrates mainly from Australia, Bolivia, Portugal, and several African countries. The company also operated a 360-t/yr electrolytic, high-purity tin refinery at the smelter site. According to the specifications, this high-purity, premium-grade refined tin contains 99.995% tin, 0.0006% arsenic, 0.0027% lead, 0.0004% bismuth, 0.0004% copper, 0.0007% antimony, 0.0001% each for indium and iron, and less than 0.0001% each for aluminum, cadmium, cobalt, nickel, silver, and zinc. The smelter produced 22,735 t of refined tin in 1997 compared with 23,567 t in 1996.

Domestic demand for refined tin rose to 6,586 t in 1997 from 5,996 t in 1996. The major domestic tin consumer remained the solder industry, accounting for more than 50% of the total demand, followed by the tin-plating industry, about 20%; the pewter industry, about 10%; and others, 20%. Exports of refined tin dropped to 31,785 t in 1997 from 32,342 t in 1996. Export earnings from tin in 1997 were estimated to be \$170 million. The main buyers of Malaysian refined tin were, in decreasing order, Japan, the Netherlands, the United Kingdom, Taiwan, the Republic of Korea, India, and Italy. The United States was an insignificant importer of Malaysian tin in 1997.

In the industrial minerals sector, production of construction aggregates and sand and gravel continued to increase but at a lower rate than in 1996 because of a slow down in domestic construction activities in 1997. According to the Geological Survey Department, Malaysia, production of construction aggregates or crush rocks totaled 95.4 Mt and production of sand and gravel totaled 32.6 Mt in 1996. Production of limestone amounted to 27.9 Mt in 1996. Limestone was mined mainly in the States of Perak with 59 quarries operating, Sarawak with 12, Perlis and Pahang with 4 each, Kedah and Kelantan with 2 each, and Selangor with 1. Among these producing States, Perak ranked first with an annual output of about 9 Mt; followed by Kedah, 7 Mt; Selangor, 5 Mt; Perlis, 4 Mt; Sarawak, 3 Mt; Pahang and Kelantan, less than 1 Mt each. Other important industrial minerals produced in Malaysia included ilmenite, monazite, and zircon as byproducts of tin mining; barite; feldspar; kaolin; mica; and silica. Most of these industrial minerals were produced at lower levels than those of 1996 because of a slow down in the industrial production activities of the southeastern and northern Asian countries.

Malaysia's cement production increased slightly in 1997. Domestic demand for cement continued to grow but at a slower pace because of a slow down in the country's construction activities. This slow down was caused by the fiscal and monetary restraints imposed by the Government following the financial crisis of Southeast Asian nations in the second half of 1997. The capacity of Malaysia's

cement industry, however, continued to expand in 1997. Kedah Cement Holdings Bhd. expanded its capacity by 1.8 Mt/yr to 5.4 Mt/yr at its Langwai plant in Kedah. Associates Pan Malaysia Cement Sdn. Bhd. completed construction of its 1.8-Mt/yr kiln at Kantan, near Ipoh in Perak, at a cost of about \$280 million. Yeoh Tiong Lay Sdn. Bhd., in joint venture with the State Government of Pahang, brought a new 1-Mt/yr cement plant on-stream at Bukit Sagu in Pahang. The joint-venture company, Pahang Cement Sdn. Bhd., operated the Bukit Sagu cement plant.

In the mineral fuels sector, Malaysia produced a small quantity of coal in Sarawak and continued to import most of the coal requirements for its cement and utility industries. Malaysia, however, was a net exporter of oil and gas. Malaysia has considerable reserves of natural gas but less reserves of crude petroleum. Its proven reserves of natural gas were estimated to be 2.26 trillion cubic meters, accounting for 1.57% of the world total in 1997. Its proven reserves of crude petroleum were estimated to be 3.9 billion barrels, accounting for 0.38% of the world total in 1997 (Oil and Gas Journal, 1997b).

In exploration of oil and gas, Esso Production Malaysia, Inc. (EPMI) and PETRONAS-Carigali Sdn. Bhd. (PCSB), the upstream arm of the Government-owned Petroleum Nasional Bhd. (PETRONAS), made a significant oil and gas discovery at the Ironfield in Block PM-9. The Iron-3 well at the Ironfield, about 209 km north of Kerteh offshore Terengganu in the South China Sea, flowed on test at a rate of 5,889 bbl/d of oil and 107,887 cubic meters per day of natural gas from a single reservoir zone. PCSB was the operator of the block with 60% interest. Exploration for natural gas was most active in the Malaysia-Thailand Joint Development Area (JDA) governed by the Malaysia-Thailand Joint Authority (MTJA). The JDA covers Blocks A-18 and B-17 to C-19. In past years, the total cumulative exploration expenditures in JDA had exceeded \$208 million. As of June 1997, about 368 billion cubic meters of natural gas reserves had been discovered. Natural gas reserves on Block A-18, operated by the joint venture of PCSB and Triton Energy Corp. of the United States, were estimated to be 283 billion cubic meters. Natural gas reserves on Block B-17, operated by the Petroleum Authority of Thailand and PCSB, were estimated to be 85 billion cubic meters (Oil and Gas Journal, 1997a).

Production of natural gas continued to increase but at about half of the 22% growth rate registered in 1996 owing to a lower demand in the domestic market. Natural gas production was mainly from gasfields, offshore Sabah, Sarawak, and Terengganu. About 25.5 million cubic meters per day (Mm³/d) of natural gas, produced by PCSB and EPMI from the gasfields offshore Terengganu, was delivered to the gas-processing plants in Kerteh. The processed natural gas was then delivered by pipeline as fuel to the end users, which included households, manufacturers, and power companies, as well as feed stock to petrochemical plants in Peninsular Malaysia and Singapore. About 2.8 Mm³/d of natural gas, produced by Sabah Shell Petroleum Co. Ltd. from the gasfields offshore Sabah, was delivered to the processing plant on Labuan Island. The processed natural gas was then delivered to the methanol plant as feed stock and to the direct-reduction iron plant as fuel on Labuan Island. About 77 Mm³/d of natural gas, produced by PCSB and Sarawak Shell Bhd. from the gasfields offshore Sarawak, was delivered to two LNG plants and the ammonia and urea plants in Bintulu for the production of LNG and nitrogen fertilizers.

Production of LNG by Malaysia LNG Sdn. Bhd. (MLNG) and

Malaysia LNG Dua Sdn. Bhd. (MLNG-2), both at Bintulu, Sarawak, increased by 2.2 Mt to 15.3 Mt in 1997. All the LNG production by MLNG was exported to Japan under a 20-year contract with the Japanese utilities companies. The LNG production by MLNG-2 was exported to various energy companies in Japan, the Republic of Korea, and Taiwan under long-term contracts.

Malaysia's crude petroleum production, including condensate, averaged 714,209 bbl/d, slightly less than the 1996 average of 715,710 bbl/d. Crude petroleum was produced from 14 oil and gasfields offshore Terengganu, operated by PCSB and EPMI; 13 oil and gasfields offshore Sarawak, operated by Sarawak Shell Bhd. (SSB); and 7 oil and gasfields offshore Sabah, operated by Sabah Shell Petroleum Co. Ltd. (SSP). About 57% of crude petroleum output was from EPMI and a joint venture of EPMI and PCSB from oil and gasfields offshore Terengganu. The remaining 43% was from SSP, SSB, and a joint venture of SSB and PCSB from oil and gasfields offshore Sarawak and Sabah. The major oil and gasfields developed and operated by PCSB included the Dulang Oilfield, the Duyong Gasfield, and the PM Fields offshore Terengganu, on the East Coast of Peninsular Malaysia; nine oilfields in the Baram Delta region, offshore Sarawak; and the Tembungo Oilfield and the Samarang Oilfield, offshore Sabah.

Malaysia exported about 52%, or 370,000 bbl/d, of its petroleum output in 1997. Exports of crude petroleum were mainly to Japan, the Republic of Korea, Singapore, and Thailand. Malaysia imported about 40,000 bbl/d of heavy crude oil to meet the requirement for its domestic oil refineries in 1997.

Malaysia had five oil refineries with a total capacity of 370,700 bbl/d in 1997. PETRONAS operated a 100,000-bbl/d refinery at Melaka on the West Coast of Peninsular Malaysia and a 40,000-bbl/d refinery at Kertik on the East Coast of Peninsular Malaysia. Esso operated an 80,700-bbl/d refinery at Port Dickson on the West Coast of Peninsular Malaysia. Shell operated a 105,000-bbl/d refinery also at Port Dickson and a 45,000-bbl/d refinery at Lutong in East Malaysia (Oil & Gas Journal, 1997c). PETRONAS (45%), in joint venture with CONOCO Asia Ltd. of the United States (40%), and Statoil, the state oil company of Norway (15%), was expected to complete construction of a 100,000-bbl/d refinery at Melaka by mid-1998. This new oil-refining complex would contain a 62,000-bbl/d vacuum distillation unit, a 26,000-bbl/d catalytic cracker, a 28,500-bbl/d hydrocracker, a 35,000-bbl/d desulfurization unit, and a 21,000-bbl/d coker.

References Cited

Avocet Mining PLC, 1997, Chairman's statement—gold: London, Avocet Mining PLC Interim Report, September 30, p. 3.

- 1998, Trading update and proposed rights issue: London, Avocet Mining PLC press release, March 5, p. 1.
- Far Eastern Economic Review, 1997, Regorging Perwaja: [Hong Kong], Far Eastern Economic Review, v. 160, May 29, no. 22, p. 61.
- Geological Survey Department, Malaysia [Kuala Lumpur], 1996a, Commodity review—Gold: Geological Survey Department, Malaysia Mineral Yearbook 1996, p. 16.
- 1996b, Commodity review—Limestone: Geological Survey Department, Malaysia Mineral Yearbook 1996, p. 64.
- 1996c, Major mineral exploration and mining projects in Peninsular Malaysia, Sarawak, and Sabah: Geological Survey Department, Malaysia Mineral Yearbook 1996, p. 92-94.
- Mining Journal, 1997, Depreciation triggers Malaysian tin panic: [London], Mining Journal, v. 329, no. 8458, December 5, p. 472.
- Oil & Gas Journal, 1997a, New plan seeks to boost Malaysia gas output: Oil & Gas Journal, v. 95, no. 29, July 21, p. 34-35, 95.
- 1997b, Worldwide look at reserves and production: Oil & Gas Journal, v. 95, no. 52, December 29, p. 38-39.
- 1997c, Worldwide refinery survey, 1997: Oil & Gas Journal, v. 95, no. 51, December 22, p. 66.

Major Sources of Information

The Ministry of Primary Industry:

Department of Mines, Malaysia
22nd Floor, Tabung Haji Bldg.
Jalan Tun Razak, 50656 Kuala Lumpur, Malaysia
Telephone: 60-3-261-1400
Fax: 60-3-261-7300
Geological Survey Department, Malaysia
19th-21st Floor, Tanbung Haji Bldg.
Jalan Tun Razak, 50736 Kuala Lumpur, Malaysia
Telephone: 60-3-261-1033
Fax: 60-3-261-1036

Major Publications

Department of Mines, Malaysia:

Bulletin on Mining Statistics, quarterly and
Statistics on Mining Industry in Malaysia, monthly.

Geological Survey Department, Malaysia:

Annual Report and Malaysia Minerals Yearbook, annual.

Department of Statistics, Malaysia:

Statistical Bulletin, Malaysia, monthly.

Statistical Bulletin, Sabah, annual.

Statistical Bulletin, Sarawak, annual.

Yearbook of Statistics, Malaysia, annual.

TABLE 1
MALAYSIA: PRODUCTION OF MINERAL COMMODITIES 1/

(Metric tons unless otherwise specified)

Commodity 2/	1993	1994	1995	1996	1997 p/	
METALS						
Aluminum, bauxite, gross weight	thousand tons	69	162	184	219	279
Copper, mine output, Cu content (Sabah)		25,182	25,267	20,751	20,219 r/	18,555
Gold, mine output, Au content 3/	kilograms	4,462	4,085	3,161	2,829 r/	4,488
Iron and steel:						
Iron ore and concentrate	thousand tons	246	243	202	325	269
Steel, crude	do.	1,808	2,046	2,450	3,216 r/	3,200
Lead metal, secondary		29,000	33,200	33,600	36,000 r/	36,000
Manganese, gross weight		--	--	37,600	--	--
Rare-earth metals, monazite, gross weight		429 r/	426 r/	822 r/	618	688
Silver, mine output, Ag content 3/	kilograms	14,008 r/	13,342	11,079 r/	9,720 r/	9,647
Tin:						
Mine output, Sn content		10,384	6,458	6,402	5,175 r/	5,065
Metal, smelter		40,079	37,990	39,433	38,051 r/	33,289
Titanium:						
Ilmenite concentrate, gross weight		278,950 r/	116,696 r/	151,680	244,642	167,504
Dioxide		22,854	36,000	43,000 e/	46,000 e/	46,000 e/
Tungsten, mine output, W content		2	--	--	--	--
Zirconium, zircon concentrate, gross weight		2,184	1,656	3,790	4,511	4,050
INDUSTRIAL MINERALS						
Barite		11,551	17,144	16,966	17,458	2,608
Cement, hydraulic	thousand tons	8,797	9,928	10,713	12,349 r/	12,700
Clays, kaolin		249,852	252,628	211,182	209,562	187,411
Feldspar		--	25,000	27,850	13,983	15,000 e/
Mica		4,659	4,993	5,848	5,501	5,708
Nitrogen, N content of ammonia		333,700	313,300 r/	332,800 r/	328,600 r/	243,200
Sand and gravel	thousand tons	792,659	725,756	695,859	1,168,294	1,150,000 e/
Silica sand (Peninsular Malaysia and Sarawak)		355,379	245,524	287,515	268,800	205,000
Stone:						
Dolomite		27,800	37,700	28,100	16,500	8,870
Limestone	thousand tons	21,678 r/	22,512 r/	22,260 r/	27,905 r/	26,000 e/
MINERAL FUELS AND RELATED MATERIALS						
Coal	do.	264	174	112	83	105
Gas, natural: 4/						
Gross	million cubic meters	28,174	30,251	36,485	44,362 r/	48,672
Net 5/	do.	21,648	24,397	29,022	35,268	38,694
Petroleum: 4/						
Crude	thousand 42-gallon barrels	235,425	238,491	257,471	261,234 r/	260,686
Refinery products:						
Gasoline	do.	14,664	15,879	19,076	19,675	20,600 e/
Jet fuel e/	do.	3,100	3,200	7,700 r/	8,000 r/	8,100 e/
Kerosene	do.	8,257	12,026	14,547	16,862	17,200 e/
Diesel	do.	31,458	38,490	44,148	47,183	50,900 e/
Residual fuel oil	do.	15,901	14,416	15,364	18,611	21,300 e/
Other e/ 6/	do.	13,000	14,000	15,000	17,000	15,700 e/
Total e/ 7/	do.	86,400	98,000	116,000 r/	127,000 r/	134,000 e/

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

1/ Table includes data available through June 17, 1998.

2/ In addition to the commodities listed, a variety of crude construction materials, including clays and stone, fertilizers, and salt, is produced, but not reported, and available information is inadequate to make reliable estimates of output levels.

3/ Includes byproduct from copper mine in Sabah and tin mines in Peninsular Malaysia, gold mines in Peninsular Malaysia and Sarawak.

4/ Includes production from Peninsular Malaysia, Sabah, and Sarawak.

5/ Gross less volume of reinjected and flared.

6/ Includes liquefied petroleum gas, naphthas, and lubricants.

7/ Data are rounded to three significant digits; may not add to totals shown.

Sources: Ministry of Primary Industry, Department of Mines (Kuala Lumpur). Monthly Statistics on Mining Industry in Malaysia, Monthly, 1997. Mining Statistics, Quarterly Bulletin, 1997. Geological Survey Department (Kuala Lumpur). Malaysian Minerals Yearbook 1996.

TABLE 2
MALAYSIA: STRUCTURE OF THE MINERAL INDUSTRY FOR 1997

(Thousand metric tons unless otherwise specified)

Commodity		Major operation companies and major equity owners	Location of main facilities	Annual capacity
Bauxite		Johore Mining and Stevedoring Co. Sdn. Bhd. (owned by Aluminium Ltd. of Canada, 61%; local investors and other, 39%)	Bukit Raja-Pengerang, Johor	400
Cement		Associated Pan Malaysia Cement Sdn. Bhd. (owned by Malaysia Cement Bhd., 58%; and Pan-Malaysia Cement Work Bhd., 42%)	Rawang, Selangor and Kantan, Perak	4,050
Do.		Cement Industries of Malaysia Bhd. (publicly owned company)	Kangar, Perlis	2,000
Do.		Kedah Cement Holdings Bhd. (majority owned by Bolton Bhd. and minority by general public shareholders)	Langwai, Kedah	5,400
Do.		Perak-Hanjoong Simen Sdn. Bhd. (owned by Korea Heavy Industries and Construction Co., 60%; and Perak State government, 40%)	Padang Rengas, Perak	1,440
Do.		Tasek Cement Bhd. (publicly owned company)	Ipoh, Perak	1,500
Do.		Pahang Cement Sdn Bhd. (joint venture of Pahang State Government and Yeoh Toing Lay Sdn. Bhd.)	Bukit Sagu, Pahang	2,300
Copper, concentrate		Mamut Copper Mining Sdn. Bhd. (wholly owned subsidiary of Mega First Corp. Bhd.)	Mamut, Sabah	100
Gas:				
Natural	million cubic meters per day	Esso Production Malaysia Inc.	Offshore Terengganu	26
Do.	do.	Sabah Shell Petroleum Co. Ltd.	Offshore Sabah	2.8
Do.	do.	Sarawak Shell Bhd.	Offshore Sarawak	77.7
Liquefied		Malaysia LNG Sdn. Bhd. (owned by Petroliam Nasional Bhd, 60%; Shell Gas N.V., 17.5% ; Mitsubishi Corp., 17.5%;and Sarawak State government, 5%)	Tanjung Kidurong, Bintulu, Sarawak	9,600
Gold, refined	kilograms	Specific Resources Sdn. Bhd. (joint venture of Pahang State Development Corp. and Avocet Mining PLC of the United Kingdom)	Penjon, Pahang	3,110
Petroleum, crude	million 42-gallon barrels per day	Esso Production Malaysia, Inc.	Offshore Terengganu	390
Do.	do.	Sabah Shell Petroleum Co. Ltd.	Offshore Sabah	100
Do.	do.	Sarawak Shell Bhd.	Offshore Sarawak	184
Do.	do.	PETRONAS Carigali Sdn. Bhd.	Offshore Terengganu	22
Steel, crude		Perwaja Steel Sdn. Bhd. (owned by Maju Holdings Sdn. Bhd, 51%; Federal Government, 44%; and Teregganau Government, 5%)	Kemaman, Terengganu	1,200
Tin:				
Concentrate		Rahman Hydraulic Tin Bhd. (privately owned company)	Klian Intan, Perak	1
Do.		Petaling Tin Bhd. (wholly owned subsidiary of Malaysia Mining Corp. Bhd.)	Kuala Langat, Selangor	2
Do.		Tima Langat Bhd. (65% owned by Selangor State government and 35% by Malaysia Mining Corp. Bhd.)	do.	1
Refined		Escoy Smelting Sdn. Bhd. (formerly Datuk Kermate Smelting Bhd. which is owned by Amalgamated Metal Corp., 51%; Consolidated Tin Smelter Ltd., 29%; and Malaysia Mining Corp. Bhd., 20%) 1/	George Town, Penang	20
Do.		Malaysia Smelting Corp. Bhd. (owned by The Straits Trading Co. Ltd., 37.44%; Malaysia Mining Corp., 37.44%; and other, 25.12%)	Butterworth, Penang	40
Titanium, oxide		Tioxide (Malaysia) Sdn. Bhd. (owned by Tioxide Group PLC, 85% and Terengganu State Government, 15%)	Kemaman, Terengganu	50

1/ To be closed at the end of March 1998.