

THE MINERAL INDUSTRY OF MALAYSIA

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Malaysia, which borders Brunei, Indonesia, and Thailand in Southeast Asia, was a middle-income developing country in Asia and the Pacific. It has a total land area of about 328,600 square kilometers (km²) and, in 2003, had a population of about 25.1 million. In 2003, Malaysia's per capita gross domestic product (GDP) based on purchasing power parity was estimated to be \$9,471 (International Monetary Fund, 2004§¹). Malaysia's identified mineral resources were barite, bauxite, carbonate rocks, clays, coal, copper, gold, natural gas, iron ore, crude petroleum, silica, tin, and minerals associated with tin placer deposits, such as ilmenite, monazite, struverite [a columbium (niobium)/tantalum-bearing mineral], and zircon. In 2003, Malaysia's proven reserves of natural gas ranked 14th in the world (Oil & Gas Journal, 2003b). Malaysia was the world's third ranked exporter of liquefied natural gas (LNG) after Indonesia and Algeria in 2003 (Poten.com, 2003§).

Malaysia's economy continued to improve in 2003 owing mainly to growth in the manufacturing and mining sectors. Malaysia's GDP in 1987 constant dollars grew by 5.2% in 2003 compared with 4.1% in 2002. The output of the manufacturing sector grew by 8.2% in 2003 compared with 4.0% in 2002, and the output of the mining and quarrying sector grew by 4.8% in 2003 compared with 3.7% in 2002. The higher growth rate in the mining and quarrying sector was a direct result of increased production of oil and natural gas. In 2003, the mining and quarrying sector contributed 7.2% to Malaysia's GDP; more than 95% of this contribution was by the oil and gas industry. In 2003, Malaysia's GDP in 1987 constant dollars was estimated to be \$60.71 billion, of which \$4.36 billion was contributed by the mining and quarrying sector (Central Bank of Malaysia, 2004c§; International Monetary Fund, 2004§).

Government Policies and Programs

Because of the economic slowdown during 2002 and early 2003, the Government announced a \$1.9 billion economic stimulus package in May 2003 to revive the Malaysian economy. The economic slowdown reportedly was worsened by the outbreak of Severe Acute Respiratory Syndrome (SARS), the Iraq war, and a 40.7% drop in foreign direct investment. The Government intended for the economic stimulus package to encourage private investment, to strengthen the country's competitiveness, and to develop new sources of growth. The package also was expected to help Malaysia reduce its dependence on exports and cope with the difficult economic environment and to enable the country to carve a niche for itself in Southeast Asia.

To attract investments, restrictions on foreign-equity participation in new projects were lifted, and foreign

investors were allowed to hold a 100% equity interest in new projects without any export commitments. For new sources of growth, the Government would emphasize and promote tourism, education, and health in the service sector and, in the manufacturing sector, the Government would promote production of value-added goods (Asian Chemical News, 2003).

Environmental Issues

To restore disused mining land, the Forest Research Institute of Malaysia (FRIM) reportedly launched a pilot program in 2001 to rehabilitate the 121.4-hectare (ha) former tin mine site in Bidor, State of Perak, which had been given to the FRIM by the State Government, and to turn the land into tropical forest plantations. According to the FRIM, the project, which was in its third year in 2003, was expected to show full results in 20 to 30 years. The former tin mining land was made up of unproductive sand tailings and slime. The project was to change the condition of the soil by adding fertilizer and nutrients. Under this pilot program, 13 species of forest trees with high commercial value have been planted. The trees that were growing well included mahogany, teak, and such local species as acasia, malabera, meranti bukit, merawan siput jantan, merbau, mersawa, setang, and such local medicinal plants as mengkudu and tongkat Ali. The rehabilitation project was funded by the Government and by the Association of Southeast Asian Nations (ASEAN)-Korea Environmental Cooperation. If the pilot program is proven a success, then it could become an economic model for other former mining land of about 113,700 ha, of which 97,260 ha was unproductive sand tailings and slime. According to past studies, many of those former mining lands contained potentially toxic heavy metals, which were not suitable for growing fruit trees and vegetables. Most former mining land is located in the States of Johor, Kuala Lumpur, Perak, and Selangor (New Straits Times, 2003a, c).

Production

In 2003, Malaysia produced bauxite, coal, carbonate rocks (construction aggregate and limestone), feldspar, gold, ilmenite, iron ore, kaolin, mica, monazite, natural gas, crude petroleum, sand and gravel, silica, struverite, tin, and zircon concentrate. Despite the higher tin prices in the Kuala Lumpur Tin Market, production of tin dropped to an historically low level in 2003 because of depleting ore reserves and lower ore grades. Production of natural gas and crude petroleum increased in 2003 because of increased exports of crude petroleum and LNG. Production of processed mineral products included cement, refined gold, refined lead (secondary), LNG, nitrogen fertilizer materials (ammonia and urea), refined petroleum products, crude steel, titanium dioxide pigment, and refined tin (table 1).

¹References that include a section mark (§) are found in the Internet References Cited section.

Trade

In 2003, Malaysia's exports increased by 11.5% to \$104.97 billion compared with \$94.13 billion in 2002; imports increased by 4.9% to \$83.62 billion compared with \$79.75 billion in 2002. Malaysia's merchandise trade surplus increased by 180% to \$10.84 billion compared with \$3.87 billion in 2002 owing to a 36% increase in export earnings from palm oil, a 35% increase in export earnings from LNG, and a 35% increase in export earnings from crude petroleum in 2003. Malaysia remained a net exporter of minerals in 2003 because of its large exports of LNG and crude petroleum. In 2003, the major export mineral commodities were crude petroleum (\$4.12 billion), LNG (\$3.51 billion), and refined tin (\$74.7 million) (Central Bank of Malaysia, 2004a§, b§).

Malaysia had a trade deficit in nonfuel minerals and processed mineral products that excluded oil and gas during the past several years. In 2002 (the last year for which data were available), exports of major minerals totaled \$38.2 million. Of this total, \$24 million was for nonmetallic minerals; \$14 million, metallic minerals; and \$200,000, others. Imports of major minerals totaled \$384 million in 2002. Of this total, \$174 million was for coal; \$139 million, metallic minerals; and \$71 million, nonmetallic minerals. Exports of major processed mineral-based products totaled \$2.31 billion in 2002. Of this total, \$1.69 billion was for processed metallic mineral products; and \$618 million, processed nonmetallic mineral products. Imports of major processed mineral-based products totaled \$5.07 billion. Of this total, \$4.57 billion was for processed metallic mineral products, and \$496 million, processed nonmetallic mineral products (Minerals and Geoscience Department [Malaysia], 2003a, p. 7-9).

Malaysia's imports of minerals and their products continued to outweigh exports in 2003. According to the Ministry of Primary Industry, this situation might prompt the Government to shift its policy and push for greater expansion of the domestic minerals industry. Doing so would make it possible for the country to reduce imports of essential minerals and mineral-based products because most of these imported minerals, such as coal, many nonmetallic minerals, and tin ore, were available in Malaysia (Star, The, 2003a).

Structure of the Mineral Industry

Malaysia's mining industry consisted of a small mining sector of coal and ferrous and nonferrous metals, a small mineral-processing sector of ferrous and nonferrous metals, and a large mining and processing sector of industrial minerals and oil and gas. With the exception of oil and gas, mining and mineral-processing businesses were owned and operated by private companies incorporated in Malaysia. Oil and gas exploration, production, and processing businesses were owned and operated by Petroliam Nasional Berhad (PETRONAS), which was the state-owned oil and gas company, and by joint ventures of PETRONAS and foreign companies. Total employment of the mining and quarrying sector was about 29,000, or about 0.3% of the country's total work force in 2002 (the last year for which data were available) (International Monetary Fund, 2004, p. 6).

The structure of the mineral industry changed in 2003. Production capacity of barite, bauxite, and tin continued to decrease because of depleting ore reserves. Malaysia's sole tin smelter had extended its business into mining by acquiring Radman Hydraulic Tin Bhd. which was one of Malaysia's leading tin miners. The country's cement industry went through further consolidation in 2003 and Hongkew Holdings (M) Sdn. Bhd. resumed construction of an abandoned half-finished cement plant, which was scheduled for completion in the next 2 to 3 years. Malaysia brought onstream seven new offshore oilfields and gasfields and the Malaysia LNG Tiga Sdn. Bhd.'s LNG plant during 2003. As a result, Malaysia's oil and gas production capacity increased by about 4%, and its LNG production capacity, by about 43% in 2003.

Commodity Review

Metals

Aluminum.—In 2003, Charus Development Corp. and its partners, which proposed to build a 500,000-metric-ton-per-year (t/yr) aluminum smelter in the State of Perak, decided to construct its own powerplant instead of purchasing power from the state-owned power company after the Malaysian Prime Minister gave a verbal endorsement. By May 2003, the joint-venture firm, MASCO Aluminium Sdn. Bhd., was established to develop the aluminum smelter. Under a new plan, the \$3.42 billion aluminum smelter complex would comprise a primary aluminum smelter that would be constructed at the Lumut Port Industrial Zone in Perak in two stages, and a powerplant. In the first stage of smelter construction, which would be completed by late 2005, the smelter would have a capacity of 230,000 t/yr; in the second stage, which would be completed by late 2008, an additional 460,000 t/yr capacity would be added for a total capacity of 690,000 t/yr (instead of 500,000 t/yr). The dedicated powerplant, which would consist of seven 300-megawatt (MW) coal-fired generating units, would supply power to the aluminum smelter complex. The coal-fired powerplant would be built within 3 kilometers (km) of the aluminum smelter. According to the Perak State Development Corp., construction of the powerplant was expected to begin by late 2003, and construction of the aluminum smelter would begin soon after. The primary aluminum smelter turnkey contractor was awarded to China Metallurgical Equipment Corp., which would use 300 kilovolt-ampere pre-bake cell technology from the Shengyang Aluminium and Magnesium Engineering and Research Institute of China; the smelter project management consultant was Kaiser Engineers of the United Kingdom (Sun, The, 2003a, b).

According to the Dubai-based Gulf International Investment Group Capital (GIIG Capital), its \$2 billion aluminum smelter project in Sarawak, East Malaysia, was proceeding according to schedule despite a report that Dubai Aluminium Co. Ltd. (Dubal), which was the project's other partner, had withdrawn from the proposed project for unknown reasons. In March 2003, a memorandum of understanding (MOU) was signed between the state-owned Sarawak Hidro Sdn. Bhd. (SHSB) and Smelter Asia Sdn. Bhd. (SASB), which was a joint-venture company established by Dubal and GIIG Capital to develop the proposed

aluminum smelter near Bintulu in Sarawak. Under the MOU, the Bakun Hydroelectric Dam, which would be developed by SHSB, would sell up to 900 MW of electricity, which was more than one-third of its 2,400-MW power-generating capacity, to the SASB's aluminum smelter by 2012. According to SASB, construction of the aluminum smelter was expected to begin by the end of 2003 and the first-phase production of 250,000 metric tons (t) primary aluminum ingots was scheduled to start in 2005. In 2003, SASB was conducting an environmental impact assessment study. The company reportedly planned to install the latest computerized control and fume treatment system into the plant and would also employ the best health, safety, and environmental practices (Star Online, The, 2003§).

Gold.—In 2003, gold was produced mainly from the Penjom Mine in the State of Pahang and a few other small-scale gold mines in the States of Pahang, Kelantan, and Terengganu. A small quantity of gold also was produced as byproduct from tin mines in the State of Selangor.

Avocet Mining PLC, which was Malaysia's largest gold mining company, operated the Penjom Mine at Ampang Jaleh near Kuala Lipis through Specific Resources Malaysia Sdn. Bhd. (a wholly owned subsidiary of Avocet Mining). According to Avocet Mining, the Penjom Mines produced 3,869 kilograms (kg) of gold in the fiscal year that ended on March 31, 2004; 3,387 kg of gold in the fiscal year that ended on March 31, 2003; and 3,339 kg of gold in the fiscal year that ended on March 31, 2002. Increased gold production in the fiscal year that ended on March 31, 2003, was due to higher ore grade and increased recovery rate. In the fiscal year that ended on March 31, 2003, the Penjom Mine mined 14.4 million metric tons (Mt) of ore and waste and processed 523,600 metric tons (t) of ore compared with 20.6 Mt and 539,000 t, respectively, in the fiscal year that ended on March 31, 2002. The average ore head grade was 7.28 grams per metric ton (g/t) gold, and the process recovery rate was 89% compared with 7.14 g/t gold and 87%, respectively, in the fiscal year that ended on March 31, 2002. Plant throughput, however, was slightly reduced owing to milling of harder rock in the fiscal year that ended on March 31, 2003 (Avocet Mining PLC, 2003§, 2004§).

In early 2003, Avocet Mining conducted a re-evaluation of Penjom's mineral resources potential to obtain a better understanding of Penjom's complex geology. Penjom mineral resources were revised according to the improved understanding of mineralization controls developed by the company's exploration team. As a result, the Penjom gold resources estimates were revised to 4,767,500 t with an average grade of 4.46 g/t gold at a 0.8 g/t gold cut-off. Of these gold resources, 811,300 t was measured resources at a grade of 5.63 g/t gold; 1.58 Mt, indicated resources at a grade of 4.95 g/t gold; 1.62 Mt, inferred resources at a grade of 4.16 g/t gold; and 754,300 t, stockpiled resources at a grade of 2.83 g/t gold. For gold exploration in Malaysia, Avocet Mining acquired the right to explore in a 5,600-ha area known as Sungai Luit (River of Money) in the State of Pahang; the company allocated a total of \$2.5 million for this project in 2003. The 2003 budget included development of an underground mine at Penjom (Avocet Mining PLC, 2003§).

Iron and Steel.—The amount of low-grade iron ore produced from several small iron mines in the States of Pahang, Perak, and Terengganu was small compared with Malaysia's iron ore requirements for its iron and steel industry. Malaysia exported between 25% and 50% of its low-grade iron ore production to China and Hong Kong and the remainder was consumed by domestic pipe-coating plants and cement plants. All high-grade iron ore requirements for Malaysia's two iron-reduction plants were imported mainly from Brazil, Bahrain, Canada, and Chile. Most other raw-material requirements for Malaysia's iron and steel industry, such as ferroalloys, pig iron, steel and alloy ingots, semifinished steel products, and waste and scrap, were also met by imports (Minerals and Geoscience Department [Malaysia], 2003a, p. 29).

Malaysia's production of direct-reduced iron (DRI) was by the state-owned Perwaja Steel Sdn. Bhd., which operated a 1.2-Mt/yr DRI plant in Kemaman in the State of Terengganu. Production of hot-briquetted iron was by Amsteel Mills Sdn. Bhd., which operated a 700,000-t/yr hot-briquetted iron plant on Labuan Island off Sabah. Malaysia's production of DRI and hot-briquetted iron totaled 1.6 Mt in 2003 compared with 1.08 Mt in 2002 (Midrex Technologies, Inc., 2003§).

Malaysia crude steel production totaled 4.7 Mt in 2002 (the last year for which data were available) compared with 4.1 Mt in 2001. The major crude steel producers were Amsteel Mills, Antara Steel Mill Sdn Bhd., Malayawata Steel Bhd., Malaysia Steel Works (KL) Sdn. Bhd., and Perwaja Steel. These producers imported 3.1 Mt of steel waste and scrap as one of their main feed materials in 2002. In 2002, imports of other raw materials by the iron and steel industry included 1.5 Mt of ferroalloys, 1.3 Mt of iron ore and concentrate, 544,400 t of semifinished products, 520,702 t of iron and steel ingots, 316,100 t of other alloy steel ingots, 225,201 t of pig iron, 196,286 t of DRI and sponge, and 119,779 t of other intermediate ferrous products (Minerals and Geoscience Department [Malaysia], 2003a, p. 28).

In 2002 (the last year for which data were available), Malaysia's imports and exports of iron and steel products were 5.4 Mt and 2.0 Mt, respectively. Apparent steel consumption of all steel products was 7.36 Mt in 2002 compared with 7.39 Mt in 2001. The slight slowdown in overall demand for steel in Malaysia in 2002 was a result of weaker domestic demand and reduced exports (Southeast Asia Iron and Steel Institute, 2003§).

Tin.—Malaysia's tin mine production dropped to a record low because of depleting reserves and lower ore grades despite a higher tin price in 2003. In the Kuala Lumpur Tin Market, the average tin price rose to about \$4,950 per ton in 2003 from about \$4,030 per metric ton in 2002. During 2003, the total number of operating tin mines averaged 26, and the total number of retreatment plants, 29. Tin produced by the opencast method accounted for 42%; gravel pump, 34%; panning, 15%; retreatment plant, 7%; and dredging, 2%. Malaysia's only underground tin mine was closed in June 2002 (Minerals and Geoscience Department [Malaysia], 2003b).

Following acquisition of a 75% interest in PT Koba Tin from Iluka Resources Ltd. of Australia in April 2002, Malaysia Smelting Corp. Bhd. (MSC) reportedly increased its stake in Marlborough Resources NL of Australia to 30% from 13% in

April 2003. Marlborough Resources, which was one of the two major Australian tin mining companies and one of the major overseas feed suppliers to MSC, operated tin mining and milling facilities with a capacity of 1,300 t/yr of tin in concentrate at the Ardelthan Mine, New South Wales, Australia. MSC reportedly was looking to acquire more low-cost tin producers in Australia and other countries, such as Bolivia, Canada, and China, to improve profit margins ahead of an anticipated growth in the world demand for tin. In Malaysia, MSC was expected to acquire a 25% stake in ZR Network Sdn. Bhd., which owned Malaysia's largest tin mine at the Klian Intan site in the State of Perak. ZR Network, which was a Malaysian trading company, acquired the mining right, lease, and operating assets related to the tin mine operations at the 699.5-ha Klian Intan site from Rahman Hydraulic Tin Bhd. for about \$3 million in March 2003 (New Straits Times, 2003d; Star, The, 2003b).

MSC, which operated a 30,000-t/yr tin smelter in Butterworth, imported about 85% of its feed, which was made up of medium-grade tin concentrate and complex tin-bearing materials. The medium-grade feed normally contained 40% to 50% tin. The annual feed for the smelter averaged 40,000 t. MSC products included Electrolytic Grade (4 Nines) Tin, which contained a minimum of 99.99% tin and had a combined impurity that did not exceed 0.01%; MSC 3 Nines Low-Lead Tin, which contained a minimum of 99.9% tin and a maximum of 0.01% lead; and MSC Straits Refined Tin, which contained 99.85% tin. MSC shut down two of its four furnaces and operated at about one-half of its capacity between November 2002 and August 2003 because of weak demand and the tight feed supply. The smelter resumed normal operation at nearly 80% of capacity in the last quarter of 2003 when demand for tin in the world market gradually increased. As a result, refined tin production was estimated to be 18,000 t in 2003 and was expected to increase to 30,000 t in 2004 (Metal Bulletin, 2002; Malaysia Smelting Corp. Bhd., 2003§).

Demand for refined tin for the first 10 months of 2003 increased by 3% to 3,302 t from the same period in 2002. In 2003, the solder industry remained the major end user and accounted for 54% of the total demand followed by the tin-plating industry, 16%; the pewter industry, 13%; and other end users, 17%. Refined tin consumption by the solder industry and other end users included consumption of domestically refined and high-grade (99.9% tin) imported refined tin. Exports of refined tin dropped sharply by 44% to 15,164 t because of the tight feed supply and reduced production of refined tin by MSC during the first three quarters of 2003. Export earnings from refined tin were valued at \$75 million compared with \$111.9 million in 2002. In 2003, the major buyers of Malaysian refined tin were the Republic of Korea (32.7%), Australia (12.5%), Japan (12.3%), Singapore (11.8%), and South Africa (8.2%) (World Bureau of Metal Statistics, 2004).

Industrial Minerals

Cement.—Cement production increased by 20.3% in 2003 because of increased exports and continued growth in domestic demand; cement production was equivalent to about 60% of the industry's installed capacity. According to an estimate by

the Cement and Concrete Association of Malaysia, domestic demand for cement grew by about 9% to 13 Mt, and exports of cement and clinker grew by about 39% to 3.9 Mt in 2003. As of 2003, Malaysia's installed capacity of cement and clinker was 28.3 Mt/yr and 17.8 Mt/yr, respectively (International Cement Review, 2003a; Cement and Concrete Association of Malaysia, 2003§).

On June 27, 2003, Malayan Cement Bhd. (MC), which owned 100% equity interest in Associated Pan Malaysia Cement Sdn. Bhd. and 77.1% interest in Kedah Cement Holding Bhd., changed its name to Lafarge Malayan Cement Bhd. (LMC). LMC, which had a local market share of about 45% and had plants strategically located in Rawang, Kanthan, Langkawi, and Pasir Gudang in peninsular Malaysia, was Malaysia's leading cement producer with a total cement and clinker production capacity of 12.8 Mt/yr and 7.9 Mt/yr, respectively. LMC also owned and operated a cement-grinding plant and a bulk-import terminal in Singapore (Kuala Lumpur Stock Exchange, 2003§). LMC was a subsidiary of Lafarge SA of France, which owned a 60.88% interest in LMC through the acquisition of Blue Circle Industries plc of the United Kingdom in July 2001.

Despite the cement industry's excess capacity in Malaysia, construction of an integrated cement plant with a clinker and cement capacity of 1.2 Mt/yr and 1.3 Mt/yr, respectively, was to be completed by Hongkew Holdings (M) Sdn. Bhd. in Gus Musang, State of Kalantan, within the next 2 to 3 years in anticipation of future growth in demand for cement in the local and overseas markets. In February 2003, YTL Cement Bhd., through its wholly-owned subsidiary YTL Cement Marketing Sdn. Bhd., signed an off-take agreement with Hongkew Holdings as the sole distributor of cement produced by Hongkew Holdings' future cement plant in Gua Musang, State of Kalantan. Hongkew Holdings reportedly obtained its license in the mid-1990s and started its plant construction before the 1997 Asian financial crisis. By 2003, the Gua Musang plant was about 50% completed. Hongkew Holdings, which had spent about \$26 million on civil work and some machinery imports, was to raise \$105 million capital by issuing bonds following the signing of the agreement with YTL Cement to complete the plant construction that had been abandoned since August 1998 (International Cement Review, 2003b; YTL Cement Bhd., 2003§).

In September 2003, YTL Cement acquired the remaining 50% interest in Pahang Cement Sdn. Bhd from the Pahang State Government through Perbadanan Setiausaha Kerajaan Pahang and Pasdec Corporation Sdn Bhd. Pahang Cement, which had an integrated plant with a capacity of 1.3 Mt/yr cement and 1.2 Mt/yr clinker, became a wholly owned subsidiary of YTL Cement (YTL Cement Bhd., 2003§).

Nitrogen (Fertilizer Materials).—Malaysia produced ammonia and urea using natural gas as feedstock. ASEAN Bintulu Fertilizer Sdn. Bhd. (ABF) and PETRONAS Fertilizer (Kedah) Sdn. Bhd. (PFK) produced ammonia and granular urea, and PETRONAS Ammonia Sdn. Bhd. (PA) produced only ammonia. Ammonia production capacity (in nitrogen content) of ABF in Bintulu, State of Sarawak, was 395,000 t/yr; PFK in Gurun, State of Kedah, 378,000 t/yr; and PA in Kerth, State of Terengganu, 370,000 t/yr. Granular urea production capacity

(in gross weight) of ABF in Bintulu, State of Sarawak, and PFK in Gurun, State of Kedah, was 600,000 t/yr and 650,000 t/yr, respectively (PETRONAS, 2003b§).

In 2003, Malaysia produced 909,500 t of ammonia (in nitrogen content), of which 575,800 t was delivered to the home market and 340,900 t was exported to overseas markets. Urea production totaled 552,700 t, of which 150,900 t was consumed domestically and 375,100 t was exported mainly to Asian markets (International Fertilizer Industry Association, 2004a, b).

Mineral Fuels

Natural Gas and Petroleum.—In 2003, Malaysia was a net exporter of natural gas and crude petroleum. Production of natural gas increased to an average of 142 billion cubic meters per day from 132 billion cubic meters per day in 2002. Production of crude petroleum, which included condensate, increased to an average of 735,000 barrels per day (bbl/d) from 698,000 bbl/d in 2002. Malaysia exported about 52% of its crude petroleum and condensate production and about 50% of its natural gas production in the form of LNG in 2003 (Central Bank of Malaysia, 2004b§).

In 2003, Malaysia brought seven oilfields and gasfields onstream. The total number of producing fields increased to 63 from 56. Of those, 48 were oilfields, and 15 were gasfields (PETRONAS, 2003a§). In February, Exxon Mobil Corp. brought the Bintang Gasfield onstream through its wholly owned subsidiary ExxonMobil Exploration and Production Malaysia Inc. (EMEPMI); the field is located about 220 km offshore State of Terengganu. The Bintang contained about 28.3 billion cubic meters of natural gas and had a peak production rate of about 10 million cubic meters per day. The Bintang was developed by the 50-50 joint venture of PETRONAS through its wholly owned subsidiary PETRONAS Carigali Sdn Bhd. (PCSB) and ExxonMobil through EMEPMI, which was the operator (Exxon Mobil Corp., 2003§).

In May, Murphy Sarawak Oil Co. Ltd. (MSOC) (a wholly owned subsidiary of Murphy Oil Corp. of the United States) brought its West Patricia Oilfield onstream. The West Patricia, which is located in block SK 309 about 40 km offshore Bintulu, State of Sarawak, was developed by the joint venture of Murphy Oil, which was the operator (85%), and PCSB (15%) and had a production capacity of 15,000 bbl/d of oil (New Straits Times, 2003b).

As a result of the exploration success in the deepwater areas in the past 2 years, Malaysia's natural gas and crude petroleum proven and probable reserves increased to 2.52 trillion cubic meters and 4.54 billion barrels, respectively, compared with 2.48 trillion cubic meters and 4.24 billion barrels, respectively, in 2002 (PETRONAS, 2003a§). The country's proven reserves of natural gas were estimated to be 2.12 trillion cubic meters and accounted for 1.2% of the world total, and its proven reserves of crude petroleum were estimated to be 3 billion barrels and accounted for 0.2% of the world total in 2003 (Oil & Gas Journal, 2003b).

In January, PETRONAS awarded two production-sharing contracts (PSCs) to Murphy Oil and PCSB for oil and gas

exploration for deepwater blocks L and M in its exclusive economic zone (EEZ) offshore Sabah, Malaysia. Under the terms of the PSC, Murphy Sabah Oil Co. Ltd. (a wholly owned subsidiary of Murphy Oil) would have a 60% working interest in block L and a 70% in block M. PCSB would own the remaining 40% and 30% working interests in blocks L and M, respectively. Under the terms of the PSCs, the contractors would acquire and process 500 km² of 3-D (three-dimensional) seismic data and drill two exploration wells in each block to a minimum depth of 7,000 meters. Each contractor was expected to spend a minimum of \$21 million for exploring blocks L and M (PETRONAS, 2003e§). Murphy Oil has been awarded a total of eight blocks in Malaysia's offshore area since 1999.

In 2002, Brunei awarded two contracts to Total S.A. and Royal Dutch/Shell for oil and gas exploration for deepwater blocks J and K in its EEZ offshore Brunei. Total S.A. and Royal Dutch/Shell (Brunei's contractors) and Murphy Oil and PCSB (Malaysia's contractors) were awarded the right to prospect in the overlapped EEZ area. During the negotiation talks to resolve the dispute, Malaysia proposed that the EEZ area be treated as a joint-development area and offered a 50-50 profit-sharing arrangement (Far Eastern Economic Review, 2003). The dispute still had not been resolved by yearend.

In September, PETRONAS signed a new PSC with PCSB and Sarawak Shell Bhd. for Baram Delta offshore Sarawak following the expiration of the old PSC, which had been awarded in 1988. Under the new contract, Sarawak Shell would use the latest technologies and its worldwide experience to raise the oilfield recovery factor and to extend the life of the aging oil and gas facilities in the Baram Delta that covers the Delta's Bakau, Baram, Baronis, Betty, Bokor, Failey Baram, West Lutong, Tukau, and Siwa oilfields and three small undeveloped nearby discoveries (Baronis Timur Laut, Fatimah, and Tanjung Baram). The new contract was owned 60% by PCSB and 40% by Sarawak Shell, which was the operator (PETRONAS, 2003f§).

Total LNG production by Malaysia LNG Sdn. Bhd. (MLNG), Malaysia LNG Dua Sdn. Bhd. (MLNG-2), and Malaysia's third and newest LNG plant, Malaysia LNG Tiga Sdn. Bhd. (MLNG-3), increased to 17.4 Mt compared with 15 Mt in 2002. The construction of the MLNG-3 plant and related facilities next to the two existing plants in Bintulu, State of Sarawak, was completed by Halliburton Co.'s subsidiary Kellogg Brown & Root of the United States and JCG Corp. of Japan in 2003. The first 3.4-Mt/yr natural gas liquefaction train began operations in May 2003, and the second 3.4-Mt/yr train, in October 2003. The related facilities of MLNG-3's LNG plant included a 120,000-cubic-meter-capacity LNG storage tank and an LNG loading jetty. The plant was owned and operated by MLNG-3. MLNG-3 was a joint venture of PETRONAS (60%), Shell Gas Holdings (Malaysia) Ltd. (15%), the Government of the State of Sarawak and Nippon Oil LNG (Netherlands) BV (10% each), and Diamond Gas Netherlands BV (5%). Malaysia's three LNG complexes in Bintulu ranked as the world's single largest LNG production facility with a combined capacity of about 23 Mt/yr (Oil & Gas Journal, 2003a).

In March, MLNG and MLNG-3 signed two separate sale and purchase agreements (SPAs), which were valued at more

than \$20 billion, to supply LNG to the Tokyo Electric Power Co. Inc. and Tokyo Gas Co. Ltd. According to one of the two SPAs, MLNG should supply Tokyo Electric Power and Tokyo Gas with up to 7.4 Mt/yr of LNG for 15 years beginning in April 2003 and with an option to extend for an additional 5 years. The 15-year contract was worth about \$20 billion at the prevailing prices in 2003. The other SPA was signed between MLNG Tiga and Tokyo Electric Power for the supply of up to 540,000 t/yr of LNG for 1 year beginning in April 2003 and with an option to extend the time if mutually agreed upon by the two parties (PETRONAS, 2003c§).

In May, MLNG Tiga signed an SPA with Korea Gas Corp. to supply up to 2 Mt/yr of LNG for 7 years beginning in May 2003. The contract was valued at about \$3.2 billion at the prevailing prices in 2003 (PETRONAS, 2003d§).

Outlook

The oil and gas industry is expected to continue to dominate the Malaysian mining and quarrying sector, and the Government is expected to continue the policy of developing its hydrocarbon resources with a special emphasis on the development of its natural gas resources for industrial, petrochemical, and power-generation projects approved by the Government during the next 4 to 5 years. Production of natural gas is expected to grow faster than that of crude petroleum. Malaysia could continue to enjoy a mineral trade surplus during the next 4 to 5 years because of its large export earnings from natural gas and crude petroleum.

The country's metallic and nonmetallic minerals mining industries are expected to continue to shrink during the next 2 to 3 years. The coal mining industry, however, may expand its capacity during the next 4 to 5 years if the Government trade policy shifts to encourage development of domestic resources rather than imports. Under the Government's 2003 economic stimulus package, the country's production capacity of value-added mineral products is expected to increase. If the two pending primary aluminum smelter proposals are implemented during the next 2 to 3 years, then Malaysia could become an important primary aluminum producer in Southeast Asia.

During the next 2 years, Malaysia's economy is expected to continue to grow at a faster pace than that of 2002. Malaysia's GDP is projected to grow at a rate of 5.7% in 2004 and 6.0% in 2005 (International Monetary Fund, 2004§).

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Major Source of Information

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Major Publications

Department of Statistics [Malaysia]:
 Statistical Bulletin, Malaysia, monthly.
 Yearbook of Statistics, Malaysia, annual.

Malaysian Chamber of Mines:
 Annual Report, annual.
 Malaysia Tin Bulletin, monthly.

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TABLE 1
MALAYSIA: PRODUCTION OF MINERAL COMMODITIES¹

(Metric tons unless otherwise specified)

Commodity ²	1999	2000	2001	2002	2003 ^p	
METALS						
Aluminum, bauxite, gross weight	thousand tons	223	123	64	40	6
Columbium-tantalum metals, struverite, gross weight		675	969	8,430	2,298	2,619
Copper, mine output, Cu content, Sabah		4,600	--	--	--	--
Gold, mine output, Au content ³	kilograms	3,449	4,026	3,965	4,289	4,739
Iron and steel:						
Iron ore and concentrate	thousand tons	337	259	376	404	597
Steel, crude	do.	2,770	3,650	4,100	4,722 ^r	4,700 ^c
Lead metal, secondary		33,000	35,300	38,000	40,000	40,000
Rare-earth metals, monazite, gross weight		1,147	818	643	441 ^r	795
Silver, mine output, Ag content ³	kilograms	2,744	5	3	--	--
Tin:						
Mine output, Sn content		7,339	6,307	4,972	4,215	3,359
Metal, smelter		28,913	26,228	30,417	30,887 ^r	18,250
Titanium:						
Ilmenite concentrate, gross weight		127,695	124,801	129,750	106,046	95,148
Dioxide, gross weight ^c		46,000	46,000	50,000	56,000	56,000
Zirconium, zircon concentrate, gross weight		1,763	3,642	3,768	5,292 ^r	3,456
INDUSTRIAL MINERALS						
Barite		13,506	7,274	649	3,082 ^r	--
Cement, hydraulic	thousand tons	10,104	11,445	13,820	14,336	17,243
Clays and earth materials	do.	33,083	79,485	29,596	23,092 ^r	23,000 ^c
Clays, kaolin		213,973	233,885	364,458	323,916 ^r	376,958
Feldspar		26,940	29,895	40,509	30,819 ^r	31,000 ^c
Mica		3,675	3,835	4,107	3,669	3,609
Nitrogen, N content of ammonia		432,000	604,800	726,000	847,900	909,500
Sand and gravel	thousand tons	33,351	21,497	15,020	19,574 ^r	20,000 ^c
Silica sand, peninsular Malaysia and Sarawak		508,723	446,838	575,105	447,398 ^r	450,000 ^c
Stone:						
Aggregate	thousand tons	58,588	66,670	66,996	84,934	85,000 ^c
Dolomite		4,250	4,030	2,850	--	--
Limestone	thousand tons	23,515	26,086	32,503	27,450 ^r	30,000 ^c
MINERAL FUELS AND RELATED MATERIALS						
Coal		308,502	382,942	497,733	352,513	172,820
Gas, natural: ⁴						
Gross	million cubic meters	51,376	56,929	58,751	60,791 ^r	65,173
Net ⁵	do.	40,844	45,259	46,707	48,329 ^r	51,813
Liquefied natural gas	thousand tons	15,390	15,169	15,423	15,025	17,402
Petroleum: ⁴						
Crude and condensate	thousand 42-gallon barrels	252,115	249,159	243,696	254,770 ^r	269,370
Refinery products:						
Gasoline	do.	25,498	22,205	25,500 ^c	26,000 ^c	25,000 ^c
Jet fuel ^c	do.	7,500	7,500	7,500	7,500	7,500
Kerosene	do.	15,945	19,631	25,522 ^r	23,688 ^r	24,000 ^c
Diesel	do.	43,725	57,559	55,500 ^c	57,000 ^c	56,000 ^c
Residual fuel oil	do.	11,972	12,413	12,500 ^c	15,000 ^c	14,000 ^c
Other ^{e,6}	do.	15,000	15,500	15,500	15,000	15,000
Total ⁷	do.	120,000	135,000	142,000	144,000 ^r	142,000

^cEstimated; estimated data are rounded to no more than three significant digits; may not add to totals shown. ^pPreliminary. ^rRevised. -- Zero.

¹Table includes data available through July 2, 2004.

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

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

⁴Includes production from peninsular Malaysia, Sabah, and Sarawak.

⁵Gross less volume of reinjected and flared.

⁶Includes liquefied petroleum gas, naphthas, and lubricants.

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

Sources: Ministry of Primary Industry, Minerals and Geoscience Department (Kuala Lumpur), Malaysian Minerals Yearbook 2001, Monthly Statistics on the Mining Industry in Malaysia; Department of Statistics (Kuala Lumpur), Monthly Statistical Bulletin, April 2004; U.S. Geological Survey Minerals Questionnaire, 2002; and Southeast Asia Iron and Steel Institute, Steel Statistical Yearbook, 2003.

TABLE 2
MALAYSIA: STRUCTURE OF THE MINERAL INDUSTRY IN 2003

(Thousand metric tons unless otherwise specified)

Commodity		Major operating companies and major equity owners	Location of main facilities	Annual capacity
Bauxite		Johore Mining and Stevedoring Co. Sdn. Bhd. (ALCAN Ltd. of Canada, 61%; local investors and other, 39%)	Teluk Rumania and Sg. Rengit, Johor	400
Cement ¹		Cement Industries of Malaysia Bhd. (United Engineers Malaysia Bhd., 53.97%; others, 46.03%)	Kangar, Perlis	2,000 1,600*
Do.		Lafarge Malayan Cement Bhd. (majority owned subsidiary of Lafarge S.A.)	Rawang, Selangor; Kanthan, Perak, Langkawi, Kedah; and Pasir Gudang, Johor	12,800 7,900*
Do.		Negeri Sembilan Cement Industries Sdn. Bhd. (wholly owned subsidiary of Cement Industries of Malaysia Berhad)	Bahau, Negeri Sembilan	1,400 1,200*
Do.		Pahang Cement Sdn Bhd. (50-50 joint venture of Pahang State government and YTL Cement Berhad)	Bukit Sagu, Pahang	1,300 1,200*
Do.		Perak-Hanjoong Simen Sdn. Bhd. (Gopeng Bhd., 45%; Korea Heavy Industries and Construction Co. and others, 55%)	Padang Rengas, Perak	3,400 3,000*
Do.		Tasek Corp. (publicly owned company)	Ipoh, Perak	2,300 2,300*
Gas:				
Natural	million cubic meters per day	ExxonMobil Exploration and Production Malaysia, Inc.	Offshore Terengganu	45
Do.	do.	Sabah Shell Petroleum Co. Ltd.	Offshore Sabah	3
Do.	do.	Sarawak Shell Bhd.	Offshore Sarawak	80
Liquefied		Malaysia LNG Sdn. Bhd. (Petroleum Nasional Berhad, 65%; Shell Gas N.V., 15%; Mitsubishi Corp., 15%; Sarawak State government, 5%)	Tanjung Kidurong, Bintulu, Sarawak	8,100
Do.		Malaysia LNG Dua Sdn. Bhd. (Petroleum Nasional Berhad, 60%; Shell Gas N.V., 15%; Mitsubishi Corp., 15%; Sarawak State government, 10%)	do.	7,800
Do.		Malaysia LNG Tiga Sdn. Bhd. (Petroleum Nasional Berhad, 60%; Shell Gas N.V., 15%; Nippon Oil LNG (Netherlands) BV, 10%; Sarawak State government, 10%; Diamond Gas Netherlands BV, 5%)	do.	6,800
Gold, refined	kilograms	Specific Resources Sdn. Bhd. (joint venture of Pahang State Development Corp. and Avocet Mining plc of the United Kingdom)	Penjom, Pahang	4,000
Iron and steel:				
Hot-briquetted iron		Amsteel Mills Sdn. Bhd. (wholly owned subsidiary of Amsteel Corp.)	Labuan Island, offshore Sabah	800
Direct-reduced iron		Perwaja Steel Sdn. Bhd. (Maju Holdings Sdn. Bhd., 51%; Lion Group, 30%; Terengganu State government, 19%)	Kemaman, Terengganu	1,200
Crude steel		Amsteel Mills Sdn. Bhd. (wholly owned subsidiary of Amsteel Corp.)	Klang, Selangor	750
Do.		Perwaja Steel Sdn. Bhd. (Maju Holdings Sdn. Bhd., 51%; Lion Group, 30%; Terengganu State government, 19%)	Kermaman, Terengganu	800
Do.		Southern Steel Bhd. (Camerlin [a member of Hong Leong Group Malaysia], 40.75%; Natsteel Ltd., 27.03; other, 32.22%)	Prai, Penang	1,200
Nitrogen, ammonia		Asean Bintulu Fertilizer Sdn. Bhd. (Petroleum Nasional Berhad, 63.5%; P.T. Pupuk Sriwidjaja Indonesia, 13%; Thai Ministry of Finance, 13%; Philippines National Development Co., 9.5%; Singapore Temasek Holdings Pte. Ltd., 1%)	Bintulu, Sarawak	395
Do.		PETRONAS Fertilizer Kedah Sdn. Bhd. (wholly owned subsidiary of Petroleum Nasional Berhad)	Gurun, Kedah	378
Do.		PETRONAS Ammonia Sdn Bhd. (wholly owned subsidiary of Petroleum Nasional Berhad)	Kerth, Terengganu	370
Petroleum, crude	thousand 42-gallon barrels per day	ExxonMobil Exploration and Production Malaysia, Inc.	Offshore Terengganu	390
Do.	do.	Sabah Shell Petroleum Co. Ltd.	Offshore Sabah	100
Do.	do.	Sarawak Shell Bhd.	Offshore Sarawak	184

See footnote at end of table.

TABLE 2--Continued
MALAYSIA: STRUCTURE OF THE MINERAL INDUSTRY IN 2003

(Thousand metric tons unless otherwise specified)

Commodity		Major operating companies and major equity owners	Location of main facilities	Annual capacity
Petroleum, crude--Continued:	thousand 42-gallon barrels per day	Sarawak Shell Bhd.	Offshore Sarawak	184
Do.	do.	PETRONAS Carigali Sdn. Bhd.	Offshore Terengganu	22
Do.	do.	Murphy Sarawak Oil Co. Ltd.	Offshore Sarawak	15
Tin:				
Concentrate		Delima Industries Sdn. Bhd.	Dengkil, Selangor	1.1
Do.		Maiju Sama Sdn. Bhd.	Puchong, Selangor	1.6
Do.		New Lahat Mines Sdn. Bhd.	Lahat, Perak	0.3
Do.		Omsam Telecommunication Sdn. Bhd.	Bakap and Batu Gajah, Perak	0.5
Do.		Rahman Hydraulic Tin Bhd.	Klian Intan, Perak	1.2
Do.		S.E.K. (M) Sdn. Bhd.	Kampar, Perak	0.4
Do.		Tasek Abadi Sdn Bhd.	Senudong and Kampar, Perak	0.5
Refined		Malaysia Smelting Corp. Bhd. (The Straits Trading Co. Ltd., 37.44%; Malaysia Mining Corp., 37.44%; others, 25.12%)	Butterworth, Penang	30
Titanium, dioxide		Huntsman Tioxide Sdn. Bhd. (a subsidiary of HuntsmanTioxide of the United Kingdom)	Kemaman, Terengganu	56

¹All companies operated integrated plants. Annual capacity is for cement production; an asterisk (*) denotes the clinker capacity.