

THE MINERAL INDUSTRY OF MALAYSIA

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Malaysia's important mineral resources included antimony, bauxite, clays, coal, copper, gold, ilmenite, iron ore, limestone, natural gas, petroleum, rare earths, silica sand, and tin. Of these minerals, only its tin reserves were large and were ranked the world's third largest, after China and Brazil. Malaysia, once the world's largest tin producer, ranked sixth in tin mine production, but was the second after China in refined tin production in 1994. Malaysia remained the world's third largest liquefied natural gas (LNG) producer and an important producer of bauxite, copper, crude petroleum, ilmenite, kaolin, monazite, natural gas, and zircon in southeast Asia in 1994.

The mining industry, which contributed about 8% to Malaysia's gross domestic product (GDP), grew considerably in 1994, mainly because of increased production of natural gas and industrial minerals. According to Malaysia's Department of Statistics, the output of the mining industry grew 4% in 1994 compared with 0.7% in 1993, while Malaysia's GDP grew 8.7% in 1994 compared with 8.3% in 1993. Malaysia's GDP in 1978 constant dollars was estimated at \$42.7 billion,² of which about \$3.4 billion was contributed by the mining industry in 1994.

Government Policies and Programs

According to the Ministry of Primary Industries, the long-awaited National Mineral Development Policy was passed by the Parliament in June 1994. The policy was aimed at sustaining investors' interest in the mining industry with a modern and internationally competitive regulatory system following the decline of the tin mining industry in the 1980's. It offered fiscal incentives to encourage exploration and development of bauxite, clays, copper, coal, gold, rare metals, and silica in Malaysia by domestic and foreign companies. The fiscal incentives included lower royalty, income tax allowances on exploration expenditure, and lower imported duties on mining and exploration machineries and equipment.

In 1994, the Government reduced the corporate income tax from 34% to 32%. The tax rate will be reduced further to 30% in 1995.

Environmental Issues

The Environmental Quality Act of 1974 was the basic legislation for the prevention, abatement, control of pollution and enhancement of the environment in Malaysia. The Act

restricted the discharge of waste into the environment that violate acceptable conditions. It authorized the Ministry of Science, Technology, and the Environment to prescribe regulations and orders and to establish standards for protecting the environment from the adverse effects of economic activities. As of 1994, 15 sets of regulations and orders had been introduced by the Ministry and were enforced by the Director General of Environmental Quality of the Ministry's Department of Environment.

Under the Environmental Quality Act of 1974, the Ministry, in consultation with the Environmental Quality Council, made the Environmental Quality Order 1987 - Environmental Impact Assessment (EIA) for Prescribed Activities. Under this Order, any project in one of the 19 prescribed activities was required to conduct an EIA study and submit the report to the Director General of Environmental Quality for approval prior to project implementation. According to one of the 19 prescribed activities, mining of minerals in new areas where the mining lease covers a total area of in excess of 250 hectares (ha); or ore processing, including concentrating for aluminum, copper, gold, or tantalum; or sand dredging involving an area of 50 ha or more is subject to an EIA.

The Department of Mines, under the Ministry of Primary Industry, was the main Federal Agency to administer the provisions on environmental protection measures prescribed in the Mining Enactment. Environmental issues related to mining in Malaysia, such as landslides at mine faces, breach of tailings and water retention dams, sink-holes and ground subsidence, soil erosion, loss of natural vegetation, vibration, surface pollution, silting of rivers and streams, pollution of rivers, effects on groundwater, air pollution, noise from blasting and machinery, and rehabilitation, have been addressed.³

Production

The oil and gas industry continued to dominate the mineral industry of Malaysia in 1994. The output of crude petroleum remained at about the same level as that of 1993. Natural gas production reached a record high, while tin mine production reached a record low in 1994. As a result of a record low tin production, the output of byproducts, such as ilmenite and zircon, also declined. The output of washed bauxite and iron ore increased in 1994 owing to increased exports, while production of copper remained steady. The

production of gold, and silver decreased in 1994 because of reduced output from gold mines in Sarawak. Production of most industrial minerals increased except silica sand. Cement production reached a record high in 1994, when domestic demand for cement increased sharply. (See table 1.)

Trade

Malaysia remained a net-exporter of mineral products in 1994. Malaysia exported all of its copper concentrate, ilmenite, mica, rare earths, and zircon concentrate production; between 80% and 85% production of its smelted tin, silica sand, and natural gas production; and about 70% of its crude petroleum production in 1994. Malaysia exported most of its mineral products to Japan and neighboring Southeast Asian countries. Malaysia was an important supplier of copper, ilmenite, natural gas, crude petroleum, rare earths, and refined tin to Japan. The relative importance of Malaysia for supplying crude petroleum, rare earths, and refined tin to the United States had diminished in 1994, when U.S. imports of these commodities from Malaysia decreased considerably.

Export earnings were estimated at \$55.5 billion in 1994, of which \$2.5 billion was from exports of crude petroleum and about \$876 million from exports of natural gas (in the form of LNG). Malaysia's imports of nonfuel minerals, such as iron ore and tin concentrate, were mostly reexported after smelting. However, a considerable quantity of coal, heavy crude petroleum, nonferrous metals, and industrial minerals, including gypsum, phosphate rock, potash, and salt, were imported annually for domestic consumption.

In 1994, Malaysia's export earnings of crude petroleum and natural gas in the form of LNG totaled \$3.4 billion, accounting for about 9% of the country's total merchandise exports. Export earnings from crude petroleum and LNG decreased in 1994 because of lower oil and gas prices in the world market. Other major mineral export earnings were \$195 million from refined tin, \$58 million from copper concentrate, \$10 million from ilmenite, \$5 million from kaolin, and \$1 million each from bauxite and mica.

Malaysia continued to import about 23,000 barrels per day (bbl/d) of heavy crude petroleum from the Middle East to meet the requirement for domestic refineries. Other important mineral imports in 1994 were iron ore, tin concentrate (for reexport after smelting), cement clinker, gypsum, phosphate rock, potash, sodium carbonate, and sulfur for domestic consumption.

Structure of the Mineral Industry

The structure of Malaysia's mineral industry changed slightly in 1994. The output capacity of the tin mining industry contracted further following the withdrawal of Malaysia Mining Corp. (MMC) from tin mining in the second half of 1993. In the mineral processing sector, Perwaja Steel Sdn. Bhd. and Tioxide (Malaysia) Sdn. Bhd. emerged as major operating companies in the manufacture of

steel and titanium dioxide pigment in 1994.

According to an estimate by the Malaysian Ministry of Human Resources, the total number of persons employed by the mining and quarrying industry was 37,900 in 1994. According to the Malaysian Department of Mines, the number of workers employed by the major nonfuel minerals at the end of November 1994 was barite, 40; bauxite, 168; copper, 1,028; gold, 595; iron ore, 171; kaolin, 470; silica sand, 132; and tin, 2,068. Additionally, in 1994, 244 workers were involved in limestone quarrying; 30, mica; and 83, coal. Malaysia's total labor force rose to 7.8 million in 1994 from 7.6 million in 1993, while the unemployment rate decreased to 2.9% in 1994 from 3.0% in 1993, attributed mainly to increased employment in the construction, manufacturing, and service industries. (See table 2.)

Commodity Review

Metals

Bauxite.—Mine production of bauxite increased in 1994 because of increased demand in the overseas market. However, the 1994 output was far below the mine operating capacity. Johore Mining and Stevedoring Co. Sdn. Bhd., Malaysia's sole bauxite producer, operated a multiple-bench, open pit mine and a washing plant with a capacity of 1 million metric tons per year (Mmt/a) of ore and a work force of 170 at Bukit Raja near Pengerang Highway north of Sungai Rengit, and east of Johore Bahru. According to the company, ore reserves in the Pengerang area were expected to be depleted by 1997. The company produced three grades of bauxite from the mining area: refractory, metallurgical, and cement. Most chemical- and metallurgical-grade washed bauxite were exported to Japan and the United States, while the cement-grade bauxite was sold as raw material to domestic cement manufacturers. Exports of bauxite rose from 77,900 metric tons (mt) in 1993 to about 120,000 mt in 1994. Export earnings from bauxite were valued at about \$1 million in 1994.

Copper.—Production of copper concentrate by Mamut Copper Mining Sdn. Bhd. from the Mamut Mine in Sabah increased to about 107,000 mt from 100,129 mt in 1993. According to the Department of Mines, the average content of copper in the concentrate dropped from 25.1% in 1993 to 23.8% in 1994. The average content of gold and silver in the concentrate was 20.2 grams per metric ton (g/mt) and 121.1 g/mt, respectively, in 1994, compared with 20.40 g/mt and 136.46 g/mt, respectively, in 1993. The metal content of copper, gold, and silver in the concentrate was, respectively, about 25,500 mt, 2,220 kilograms (kg), and 13,200 kg, in 1994, compared with 25,200 mt, 2,040 kg, and 13,700 kg, respectively, in 1993. Malaysia exported all copper concentrate to Japan.

According to Mega First Corp. Bhd., the parent company of Mamut Copper Mining Sdn. Bhd., the company initially planned to convert its Mamut copper mine into a holiday

resort after mine closure in 1997. However, because of the improved performance of its mining operation, the company planned to continue exploring for copper in the area for another 2 to 3 years.⁴

In 1994, MMC began investigating various alternatives to develop the polymetallic sulfide deposit of copper, gold, and silver at Mengapur in central Pahang. According to the company annual report, one of the alternatives was to scale down the magnitude of the project by leaching the oxide ores to extract copper. MMC planned to conduct several refining test works in 1995.

Gold.—Gold production decreased in 1994, mainly because of reduced output from the Tebedu area of southwestern Sarawak. Of the total gold produced in 1994, 53% was from the Mamut copper mine in Sabah; 24% was from 15 to 21 small-scale alluvial and lode gold mines operating in the States of Johor, Kelantan, Pahang, and Terengganu; and 22% was from 2 gold mines in Sarawak.

Specific Resources Sdn. Bhd., a subsidiary of the Canadian-based Avocet Ventures Inc., successfully completed its 1994 drilling program. According to the company, seven zones of oxidized gold mineralization were identified with a resource of 2.98 million metric tons (Mmt) grading 3.4 g/mt gold over a strike length of 2 kilometers (km) and a width of about 500 meters (m) in Penjom, central Pahang. The company's in-fill drilling has proven 1 Mmt reserves in the Penjom gold property, of which about 500,000 mt at the Manik Ridge area contain near-surface shallow-dipped oxidized mineralization with an 84% recovery rate. Avocet Ventures planned to develop a mine and a processing plant to extract gold using carbon-in-leach technology following a feasibility study in 1995.⁵

In the Central Belt of peninsular Malaysia, MMC was exploring for gold in the Merapoh area of Pahang, while Valiant Consolidated Ltd. of Australia and Damar Consolidated Exploration Sdn. Bhd. of Malaysia were jointly prospecting gold in the Lipis area of Pahang in 1994. In both areas, several gold-bearing zones had been identified for further exploration in 1995.

Iron and Steel.—Iron ore production increased slightly in 1994. According to the Malaysian Department of Mines, most of the 1994 production was from six operating mines located in the States of Kedah, Pahang, and Terengganu. In 1994, about 20% of all iron ore production was a byproduct of tin mining. Malaysia exported only a small amount of iron ore in 1994, while most of the output was consumed domestically by Malayawate Steel Bhd. and cement companies as raw material.

To meet the domestic requirements for its iron and steel industry, Malaysia imported annually about 1 Mmt of iron ore mainly from Bahrain, Brazil, Chile, and Sweden; and between 160,000 mt and 200,000 mt of pig iron, principally from Brazil and Russia. Malaysia also imported annually between 700,000 mt and 1 Mmt of iron and steel scrap, principally from the United Kingdom and the United States.

Imported iron ore was consumed by the direct reduction (DR) plants operated by Perwaja Steel Sdn. Bhd. (PS) in Kemaman, Terengganu, and by Steelcorp Sdn. Bhd. (formerly Sabah Gas Industries Sdn. Bhd.) 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 is the only integrated steel producer in Malaysia. Its iron and steel complex at the Telok Kalong Industrial Estate, near Kemaman in Terengganu, consisted mainly of a 1.2 Mmt/a DR plant using the Mexican HYL III process and three 76-ton AC electric arc furnaces (steel melt shop), two 83-ton ladle furnace transformers (ladle metallurgy station), and two 4-strand billet casters and one 6-strand bloom/billet caster (continuous casting shop). With a work force of more than 1,200, PS owned and operated a supermarket and was building a housing complex for its employees.

According to PS, the iron ore requirement for its DR plant was about 1.8 Mmt/a and the raw materials mix for its steel making was 80% direct-reduced iron (DRI) and 20% ferrous scrap. Of the 1 Mmt crude steel (in the form of billet) produced in 1994, about 50% was sold to domestic and overseas markets and the remaining 50% was shipped to its 450,000 mt/a-rolling mill at Gurun in Kedah. PS was building in 1994 a 700,000 mt/a heavy-section mill at Gurun, Kedah and a new 890,000 mt/a steelmaking plant (melt shop) at Kemaman, Terengganu. Construction of both mills was scheduled for completion in late 1995 or early 1996.⁶

Steelcorp Sdn. Bhd. (formerly Sabah Gas Industries), the operator of a 600,000 mt/a DRI plant, completed a feasibility study in 1994 to build a new 1 Mmt/a hot-briquetted DRI plant next to the existing DRI plant on Labuan Island. Because of increased demand for its products by minimills in the Asian region, the company planned to expand its capacity from 600,000 mt/a to 1.6 Mmt/a by 1997.⁷

Malaysia's overall crude steel production was about 1.9 Mmt in 1994. According to South East Asia Iron and Steel Institute, Malaysia exported about 660,000 mt of DRI; 260,000 mt of steel billet; and 723,000 mt of steel products in 1993. However, to meet its domestic demand for steel products, Malaysia imported about 220,000 mt of DRI; 730,000 mt of steel billets; and 3.6 Mmt of steel products in 1993.

Because of the growing demand for iron and steel in the Asian region, Gunawan Iron and Steel Sdn. Bhd. of Indonesia obtained a license from the Government to build a 250,000 mt/a plate mill and a 1.8 Mmt/a steel slab plant at the Telok Kalong Industrial Estate, near Kemaman in Terengganu. According to the company, the first-stage construction for the plate mill began in August 1994 and was scheduled for completion in mid-1995. Most of the steel plate production for shipbuilding will be exported. The second-stage construction of the steel slab making facilities was expected to begin in late 1995 or early 1996. Major suppliers of raw materials will be Australia for iron ore and coal and India for iron ore. Equipment for the production of

pig iron and crude steel will be supplied by Western European countries.

Rare Earths.—Crude rare earths had been produced by Asian Rare Earth Ltd. (ARE) near Bukit Merah, about 6 km southwest of Ipoh in Perak, since 1982. The plant processed monazite for the production of rare-earth chloride and rare-earth carbonate. In processing monazite to produce crude rare earths, the plant also produced a low-level radioactive thorium hydroxide as a byproduct. In October 1985, nearby Bukit Merah residents filed a civil suit to stop ARE from operating until proper safety measures were taken to prevent the escape of radioactive gases from the plant. The plant was shut down for more than 1 year, but ARE resumed operation in February 1987, claiming that it had complied with the safety measures, while storing the low-level waste at a nearby site in Mukim Belanja. Operations of the rare-earth plant had been halted since a July 1992 ruling by the High Court in Ipoh against the company.

In January 1994, ARE decided that it would not resume plant operations despite a December 1993 Supreme Court decision overturning the July 1992 ruling by the High Court in Ipoh ordering the company to close the plant. According to an assessment by Malaysian rare-earth industry, the company decision was based on the fact that the processing plant was still facing charges of environmental pollution from nearby residents as well as facing competition with low-priced Chinese rare-earth products on the world market.⁸

Tin.—Malaysia's tin mining industry contracted further in 1994 because of the continued slump in the world price of tin, increased labor and equipment costs, weak worldwide demand for tin, and withdrawal of Berjuntai Tin Dredging Bhd, another major mining company, from tin mining. In early 1994, an agreement was reached by 30 tin mining companies to cut production by up to 25% in 1994. As a result, the 1994 mine output of tin dropped to another new low in Malaysia's post-World War II tin mining history.

According to Malaysia's Department of Mines, the monthly output of tin decreased to 487 mt in December 1994 from 582 mt in December 1993. Of the tin produced in 1994, 21% was by dredging, 38% by gravel pumping, 21% by open pit, 11% by panning, and 9% by amang plant and underground mining. The total number of operating mines decreased to 39 in December 1994 from 43 in December 1993. The tin mining industry's total labor force declined to 2,006 in December 1994 from 2,296 in December 1993. During 1994, the dredging sector shut down 3 dredges and laid off about 100 workers, the gravel-pumping sector closed 1 mine and laid off 7 miners, and the underground sector shut down 4 mines and laid off 93 miners.

Berjuntai Tin Dredging, one of Malaysia's oldest tin producers, stopped tin mining operations beginning in 1994. Berjuntai Tin Dredging produced about 1,500 mt/a of tin in concentrate in 1993. However, because of the tin price slump on the world market, it was unable to operate at a profit, despite its efforts to cut costs and improve productivity.⁹

According to the Malaysian Chamber of Mines, the tin industry's average break-even cost was about \$5.70/kg in 1993. However, the average price of tin on the Kuala Lumpur Tin Market was about \$5.10/kg in 1993.

Production of tin metal by Datuk Keramat Smelter Bhd. and Malaysia Smelting Corp. Bhd. increased in 1994, despite record low domestic ore production. To supplement the shortage and better utilize their smelting capacity, the smelters imported a record 59,539 mt of foreign tin ore and concentrate in 1994, compared with 48,702 mt in 1993. The major suppliers of ore and concentrate to Malaysia in 1994 were Australia, China, Peru, Portugal, The United Kingdom, and Vietnam.

Malaysia exported 35,370 mt of refined tin, compared with 35,545 mt in 1993. The major buyers of Malaysia's refined tin in 1994 were, in decreasing order, Japan, the Netherlands, the Republic of Korea, Taiwan, and the United Kingdom. Exports of refined tin to the United States declined from 6,624 mt in 1990 to less than 1,300 mt in 1994. Export earnings from refined tin remained unchanged at about \$195 million in 1994.

According to the Malaysian Department of Mines, domestic demand for refined tin rose by 8% to 5,614 mt from 5,196 mt in 1993. Of the total domestic tin consumption, about 49% was consumed by the solder industry, 20% by the tinplating industry, 10% by the pewter industry, and 21% by others.

Industrial Minerals

Cement.—Malaysia's cement production reached a new high in 1994 because of continued strong demand by the construction industry. Malaysia continued to invest heavily in its infrastructure development, office buildings, and residential housing projects. In 1994, the cement industry consisted of 10 companies operating 6 integrated plants and 4 grinding plants with a work force of about 4,300 workers. All clinker production facilities and two grinding plants were in peninsular Malaysia and one grinding plant each were in the States of Sabah and Sarawak.

In 1994, the industry's total clinker capacity was 8.6 Mmt/a, while total cement grinding capacity was 12.4 Mmt/a. Malaysia imported between 1 Mmt/a and 1.4 Mmt/a of clinker to meet mainly the clinker requirements for two grinding plants in Sabah and Sarawak. The major suppliers of clinker were Japan, Indonesia, South Korea, and Thailand. Limestone for the manufacturing of cement was supplied by local limestone quarries operated mainly in peninsular Malaysia, at Kinta of Perak, at Langkawi of Kedah, and at Puchong of Selangor. Consumption of limestone by the cement industry was estimated at 12 Mmt in 1994.

According to the Cement & Concrete Association of Malaysia, Malaysia's demand for cement grew by 12% to the 10 Mmt level because of the continued strong domestic demand by the construction industry for the public works projects, commercial buildings, and residential housing in

1994. To overcome the shortage of clinker in the State of Sabah, the State government funded a detailed feasibility study by Onoda Engineering Co. Ltd. of Japan for construction of a \$210 million clinker plant. In mid-1994, the Sabah State government was seeking foreign investment in the project of up to 30% in equity participation.¹⁰

Titanium.—Most ilmenite concentrate was recovered as a byproduct from tin tailing treatment plants operating in the States of Perak and Selangor. Production of ilmenite concentrate dropped sharply in 1994, when tin mining operations of MMC and Berjantai Tin Dredging were stopped in the two States. Exports of ilmenite concentrate also dropped to 125,000 mt in 1994 from 142,737 mt in 1993. Export earnings of ilmenite concentrate were valued at about \$10 million in 1994.

Tioxide (Malaysia) Sdn. Bhd., established in 1988, began production of titanium dioxide pigment using the sulfate process at the Telok Kalong Industrial Estate in May 1992. The output of titanium dioxide pigment reached 86% of plant capacity in 1994. According to the company, about two-thirds of its raw material requirements were met by imports from Australia and the remainder was by local suppliers in the Ipoh area of Perak. The plant produced 2 grades of pigment: TR 92, accounting for 70% of the output was for consumption by the paint and coating industries and remaining 30%, RFC 5, a finer grain, was for the plastic industry. In 1994, 90% of the total output was exported to China, Hong Kong, India, Japan, and Taiwan, while only 10% was marketed domestically. The company, having a work force of 250, planned to expand its plant capacity from 50,000 mt/a to 70,000 mt/a by upgrading the existing facility in 1995.

Mineral Fuels

Coal.—Coal production decreased in 1994. Global Minerals Sarawak (GMS), the sole producer, operated an open pit mine at Beradai in the Merit-Pila area, near Kapit in Sarawak, with about 70 workers. Most coal produced in 1994 was marketed domestically to the National Electricity Board for power generation. The underground coal mine at Silantek, in the Semantan area about 100 km southeast of Kuching in Sarawak, had been shut down since April 1991 because of operational problems. Malaysia continued to import most of its coal requirements of about 3 Mmt, including anthracite, bituminous, and lignite for metals smelting, cement manufacturing, and power generating. Malaysia's annual coal import bills in 1994 were estimated at \$140 million. Australia and Indonesia remained the two dominant coal suppliers to Malaysia in 1994.

Natural Gas.—Natural gas production rose to a record-high level in 1994 owing to increased production by Esso Production Malaysia Inc. (EPMI) from offshore Terengganu for consumption in the west coast of peninsular Malaysia and

by Sarawak Shell Bhd. (SSB) from offshore Sarawak for production of LNG and nitrogen fertilizer in the Bintulu industrial area. To increase exports of LNG to Japan, South Korea, and Taiwan, Malaysia was building a second LNG plant in Bintulu, Sarawak, and expected to double its LNG production capacity to 16 Mmt/a in 1996.

To utilize the 170 billion cubic meter (m³) natural gas reserves discovered in recent years in the Jintan, Selasih, Serai, Saderi, and Cili Padi Gasfields on block SK-8, and in the Helang Gasfield on block SK-10 offshore Sarawak, a feasibility study for construction of a third LNG plant in Bintulu, Sarawak, was completed by PETRONAS and its two partners. A joint-venture firm, Malaysia LNG-III Sdn. Bhd. (MLNG-3), was planned to be established to operate the plant. The MLNG-3 project will be owned 70% by PETRONAS and 15% each by its partners, Occidental Oil Corp. of the United States and Nippon Oil Corp. of Japan. The joint-venture firm planned to complete development of the gasfields and construction of the third LNG plant by 2000.¹¹

According to Malaysia's Department of Statistics, LNG production by Malaysia LNG Sdn. Bhd. (MLNG) in Bintulu, Sarawak, was about 8.3 Mmt in 1994, compared with 8.1 Mmt in 1993. Exports of LNG by MLNG totaled about 8.2 Mmt and were valued at \$876 million in 1994. Most of the LNG exports went to three Japanese utility companies, Tokyo Electric Power Co. Tokyo Gas Co., and Saibu Gas Co. In December, Malaysia signed an \$8-billion long-term agreement with Japan to supply LNG to four Japanese utilities, Tokyo Gas, Osaka Gas Co., Toho Gas Co., and Kansai Electric Power Co. According to the agreement, MLNG will export 2.1 Mmt/a of LNG to the four companies over a 20-year period beginning in June 1995. In late 1994, Malaysia also signed a \$900-million agreement with South Korea for MLNG to supply 5.26 Mmt/a of LNG to Korea Gas Corp. during a 5-year period starting in January 1995.

As part of the Peninsular Gas Utilization project, EPMI announced in June that it planned to invest \$650 million to develop the Lawit Gasfield, offshore the East Coast of peninsula Malaysia, and to construct onshore gas processing facilities near Kertek in Terengganu beginning in 1995. Gas production from the Lawit Gasfield was scheduled to start in April 1997 at an initial rate of 1.42 million cubic meters per day (Mm³/d), gradually increasing to 2.84 Mm³/d in 1997 and 11.32 Mm³/d in 1999.¹²

Petroleum.—Malaysia's crude petroleum production, including condensate, increased from an average of 645,000 barrels per day (bbl/d) in 1993 to an average of 653,000 bbl/d in 1994. Crude petroleum production in 1994 was by PETRONAS Carigali Sdn. Bhd. (PETRONAS CAG.), the upstream arm of PETRONAS, and three foreign contractors, EPMI, SSB, and Sabah Shell Petroleum (SSP). About 50% of the 1994 production was by EPMI from 13 oilfields, located offshore Terengganu. The remaining 50% was by SSP, SSB, and a joint-venture of SSB and PETRONAS CAG from 19 oilfields, located offshore the States of

Sarawak and Sabah. Malaysia's crude oil production capacity, including condensate, remained at an average of 690,000 bbl/d in 1994.

Export earnings from crude petroleum declined by 19% to \$2.5 billion in 1994, resulting from lower oil prices and decreased exports, to an average of about 420,000 bbl/d. Singapore, South of Korea, Japan, and the United States remained the major buyers of the Malaysia crude petroleum in 1994. Malaysia continued to import about 22,000 bbl/d of heavy crude oil in 1994 to meet the requirement for its domestic oil refineries.

In November, PETRONAS signed a \$1.4-billion agreement with Conoco Inc. of the United States to build a second 100,000-bbl/d refinery in Malacca. According to the agreement, Conoco will invest \$600 million in the refinery and will own 40% of the project, while PETRONAS will own 45%, with the remaining 15% to be owned by a third partner yet to be announced. The refinery will process Persian heavier crudes for the export market. Construction was scheduled to start in 1995 and was expected to come on-stream in late 1997. In May, PETRONAS brought on-stream its first wholly owned 100,000-bbl/d refinery in Malacca to process lighter Malaysian crudes and condensate. By yearend 1994, Malaysia had five refineries with a total refining capacity of 386,000 bbl/d, which made Malaysia self-sufficient in refined products.¹³

Reserves

Malaysia was estimated to have more than 15% of known world tin reserves. The estimated ilmenite and monazite reserves associated with tin reserves were substantial. Ore reserves of bauxite, copper, natural gas, petroleum, and other industrial minerals are small but considered significant for the area. Malaysia was ranked 22d in worldwide oil reserves and 14th in natural gas reserves. Reserves of major mineral commodities are shown in table 3, according to the Malaysian Government and industry sources. (See table 3.)

Infrastructure

Malaysia's existing highways, railroad system, and port facilities were adequate to transport most of the nonferrous mineral products to domestic and overseas markets. A consortium formed by PETRONAS, two local companies, and two Japanese firms was building a gas-reticulation system covering the States of Selangor and Johore. PETRONAS also was building a gas pipeline to link Kedah with South Thailand in 1994. As part of the PGU-III project, EPMI was scheduled to spend \$650 million in the next 3 years to build gas processing facilities in Kertek, Terengganu, and develop new gasfields offshore Terengganu to feed the processing plant.

To accommodate the transportation needs of the new growing industrial areas and in southern Johore State, the 848-km North-South Expressway along the west coast of peninsular Malaysia connecting Thailand in the north and

Singapore in the south was completed and became operational in 1994. In Johore, construction of a new second bridge for crossing to Singapore and a 43-km highway linking the North-South Expressway to western Singapore was under construction in 1994.

Malaysia's installed electricity capacity was 8,000 megawatts, and produced about 30 billion kilowatt-hours. Demand for electricity had been increasing at an average annual rate of about 11% as a result of the growing manufacturing sector during the past 5 years.

In 1994, Malaysia launched a \$100-million Port-Industries Estate Project to build a deep-water integrated port on a 405-ha industrial estate with infrastructure already in place in Lumut, Perak. According to the Malaysia Industrial Development Authority, the Port-Industries Estate Project in Lumut was scheduled to open in June 1995. The port facilities initially would be able to accommodate vessels up to 35,000 deadweight tons, including all types of dry and liquid bulk cargo, break-bulk, and containerized cargo.

Outlook

The oil and gas industry will continue to dominate the mineral industry of Malaysia because of its contribution to the Malaysian economy. Production of natural gas should also increase to more than 65 Mm³/d in the next 2 years because of the growing demand for natural gas by the manufacturers of LNG and nitrogen fertilizer materials in the Bintulu area of Sarawak and by the manufacturing and utility industries in the west coast of peninsular Malaysia as well as in Singapore.

The tin industry is expected to recover slightly in 1995 from the 1994 depression. Production of copper concentrate at the Mamut Mine in Sabah is expected to remain steady at the 100,000 mt/a level for the next 3 years. Malaysia's clinker capacity will expand by 1.8 Mmt/a to 10.4 Mmt/a and cement capacity will increase by 3 Mmt/a to 15.4 Mmt/a by 1998 as the growing demand continues for cement by the construction industry. Malaysia should emerge as an important producer of LNG, nitrogen fertilizer materials, and petrochemical products in Southeast Asia when all of the announced investment plans are successfully implemented in the next 3 to 4 years.

¹Text prepared Apr. 1995.

²Where appropriate, values have been converted from Malaysia ringgits (M\$) to U.S. dollars at the rate of M\$2.57=US\$1.00 in 1993 and M\$2.63=US\$1.00 in 1994.

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Department of Mines

11th Floor, W Block, Wisma Selangor Dredging

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Major Publications

Ministry of Primary Industry

Department of Mines: Statistics on Mining Industry in Malaysia, monthly; Bulletin on Mining Statistics, quarterly; and Bulletin of Statistics Relating to the Mining Industry of Malaysia, annual.

Geological Survey of Malaysia: Annual Report,

annually and Malaysia Minerals Yearbook, annual.

Department of Statistics: Statistical Bulletin, Malaysia, monthly; Yearbook of Statistics, Malaysia; Statistical Bulletin, Sarawak, annual; and Statistical Bulletin, Sabah, annual.

TABLE 1
MALAYSIA: PRODUCTION OF MINERAL COMMODITIES 1/ 2/

(Metric tons unless otherwise specified)

Commodity 3/	1990	1991	1992	1993	1994 p/	
METALS						
Aluminum: Bauxite, gross weight	thousand tons	398	376	331	69	162
Columbium and tantalum concentrate, gross weight		4	--	--	--	--
Cb content of columbium e/		1	--	--	--	--
Ta content of tantalum e/		--	--	--	--	--
Copper, mine output, Cu content (Sabah)		24,300	25,600	28,600	25,200	25,300
Gold, mine output, Au content:						
Malaya	kilograms	869	871	708	873	1,020
Sabah	do.	1,590	1,620	2,220	2,040	2,140
Sarawak	do.	139	291	590	1,550	920
Total	do.	2,590	2,780	3,510	4,460	4,080
Iron and steel:						
Iron ore and concentrate	thousand tons	344	376	320	223	203
Steel, crude	do.	1,200 r/	1,130 r/	1,560 r/	1,810	1,850 e/
Rare-earth metals: Monazite, gross weight		3,320	1,980	777	407	425
Silver, mine output, Ag content						
Sabah	kilograms	12,500	13,300	15,100	13,700	13,100
Sarawak 4/	do.	103	169	250	350	280
Total	do.	12,600	13,400	15,300	14,000	13,300
Tin:						
Mine output, Sn content		28,500	20,700	14,300	10,400	6,460
Metal, smelter		49,100	42,700	45,600	40,100 r/	42,000 e/
Titanium:						
Ilmenite concentrate, gross weight		530,000	336,000	338,000	289,000	116,000
Oxide		--	--	690	22,900	36,000
Tungsten, mine output, W content		--	2	3	2	--
Zirconium: Zircon concentrate, gross weight		4,280	5,580	2,610	2,180	1,660
INDUSTRIAL MINERALS						
Barite		48,300	16,600	10,500	11,600	17,100
Cement, hydraulic	thousand tons	5,880	7,450	8,370	8,800 r/	9,970
Clays: Kaolin		153,000	187,000	245,000	250,000	253,000
Limestone e/	thousand tons	16,500	20,700	22,000	23,000	24,000 e/
Mica		3,340	3,520	4,750	4,660	4,990
Nitrogen: N content of ammonia		229,000	286,000	331,000	334,000	334,000 e/
Silica sand (Malaya and Sarawak)		687,000	668,000	579,000	355,000	231,000
MINERAL FUELS AND RELATED MATERIALS						
Coal	thousand tons	99	64	74	264	174
Gas, natural: 5/						
Gross	million cubic meters	18,500	21,200	22,600	28,200	31,500 e/
Net 6/	do.	14,200	16,300	18,200	21,600	24,200 e/
Petroleum: 5/						
Crude	thousand 42-gallon barrels	227,000	238,000	241,000	235,000 r/	238,000
Refinery products:						
Gasoline	do.	11,900	13,400	13,500	14,700	14,600 e/
Jet fuel e/	do.	3,000	3,000	3,000	3,100	3,200 e/
Kerosene	do.	6,660	6,900	7,100	8,260	8,600 e/
Diesel	do.	25,600	28,000	29,400	31,500	33,500 e/
Residual fuel oil	do.	14,300	14,000	14,000	15,900	15,000 e/
Other e/ 7/	do.	12,000	12,500	13,000	13,000	13,000 e/
Total	do.	73,400 r/	77,800 r/	80,000 r/	86,400 r/	87,900 e/

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

1/ Previously published and 1994 data are rounded by the U.S. Bureau of Mines to three significant digits; may not add to totals shown.

2/ Table includes data available through Apr. 28, 1995.

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

4/ Byproduct from gold mines in Sarawak.

5/ Includes production from Malaya, Sabah, and Sarawak.

6/ Gross less volume of reinjected and flared.

7/ Includes LPG, naphthas, and lubricants.

Source: Ministry of Primary Industry, Department of Mines (Kuala Lumpur). Monthly Statistics on Mining Industry in Malaysia, Monthly, 1994; Quarterly Bulletin, Quarterly, 1994.

TABLE 2
MALAYSIA: STRUCTURE OF THE MINERAL INDUSTRY FOR 1994

(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. (61% owned by Aluminium Ltd. of Canada, 30% by local investors, and 9% by other)	Bukit Raja-Pengerang, Johor	400	
Cement	Associated Pan Malaysia Cement Sdn. Bhd. (equally owned by Malaysia Cement Bhd. and Pan-Malaysia Cement Work Bhd.)	Rawang, Selangor and Kantan, Perak	2,800	
Do.	Cement Industries of Malaysia Bhd. (publicly owned company)	Kangar, Perlis	1,600	
Do.	Kedah Cement Holdings Bhd. (majority owned by Bolton Bhd. and minority by general public shareholders)	Langwai, Kedah	1,500	
Do.	Perak-Hanjoong Simen Sdn. Bhd. (60% owned by Korea Heavy Industries and Construction Co., and 40% by Perak State government)	Padang Rengas, Perak	1,200	
Do.	Tasek Cement Bhd. (publicly owned company)	Ipoh, Perak	1,500	
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	22.7
Do.	do.	Sabah Shell Petroleum Co. Ltd.	Offshore Sabah	2.8
Do.	do.	Sarawak Shell Bhd.	Offshore Sarawak	38.5
Liquefied		Malaysia LNG Sdn. Bhd. (60% owned by PETRONAS, 17.5% each by Shell Gas N.V. and Mitsubishi Corp. and 5% by Sarawak State government)	Tanjung Kidurong, Bintulu, Sarawak	9,600
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. (Government owned)	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.)	Kuala Langat, Selangor	2
Do.		Tima Langat Bhd. (65% owned by Selangor State government and 35% by Malaysia Mining Corp.)	do.	1
Refined		Datuk Keramat Smelting Bhd. (50.5% owned by Amalgamated Metal Corp., 29% by Consolidated Tin Smelter Ltd., and 20.5% by Malaysia Mining Corp.)	George Town, Penang	40
Do.		Malaysia Smelting Corp. Bhd. (58% owned by Straits Trading Co. and 42% by Malaysia Mining Corp.)	Butterworth, Penang	60
Titanium, oxide		Tioxide (Malaysia) Sdn. Bhd. (85% owned by Tioxide Group PLC and 15% by Terengganu State government)	Kemaman, Terengganu	50

TABLE 3
MALAYSIA: RESERVES OF MAJOR MINERAL
COMMODITIES FOR 1994

(Thousand metric tons unless otherwise specified)

Commodity	Reserves
Bauxite	14,000
Clays 1/	25,600
Copper	260 e/
Gas, natural	billion cubic meters
Marble	1,930
Petroleum, crude	68,000
Tin, in concentrate	4,300
Titanium	1,100
	896 e/

e/ Estimated.

1/ Includes kaolin and ball clay.

Sources: Geological Survey of Malaysia, Malaysia Mining Corp. Bhd., and Oil and Gas Journal, Dec. 26, 1994, V. 92, No. 52, p. 42.