

THE MINERAL INDUSTRY OF

VIETNAM

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According to Vietnam's Department of Geology and Minerals under the Ministry of Industry, systematic geologic surveys and mineral exploration, conducted by the Government with the assistance of geologists from the former Soviet Union in the past 40 years, had discovered about 3,000 mineral occurrences and deposits. Based on the Government's preliminary geologic surveys and detailed exploration for 500 mineral occurrences and deposits, a wide variety of minerals had been identified. The identified minerals were antimony, apatite, bauxite, clays (kaolin), chromite, coal, copper, natural gas, gemstones, gold, graphite, iron ore, lead, limestone, manganese, nickel, crude petroleum, pyrophyllite, rare earths, silica sand, tin, titanium, tungsten, zinc, and zirconium. According to the Government's preliminary investigations, apatite, bauxite, coal, natural gas, kaolin, limestone, petroleum, rare earths, and silica sand were believed to have larger resources and greater potential for further exploration than the other mineral resources. Most of these mineral resources, except construction aggregates, coal, and petroleum, remained largely unexploited (Le, 1995).

To attract foreign investment in the mining sector, the Government of Vietnam enacted the Law on Foreign Investment in 1987 and the Ordinance on Mineral Resources in 1989. Since 1988, about 33 production-sharing contracts to explore for oil and gas and several exploration licenses to explore for copper, gold, nickel, titanium, and other minerals in Vietnam had been granted by the Government to foreign companies from Australia, Belgium, Canada, France, Indonesia, Japan, the Republic of Korea, Malaysia, New Zealand, Singapore, Thailand, the United Kingdom, the United States, and other countries.

To provide a more competitive and favorable environment for foreign investment in its mining sector, Vietnam's National Assembly passed a new Mining Law in March 1996 and enacted the new law in September 1996 to replace the Ordinance on Mineral Resources of 1989. To implement the new law, the Government issued the Decree No. 68 CP in November 1996 on regulations and guidelines for the frameworks for managing mineral resources and activities in the mining sector including geologic survey, prospecting, exploration, development, production, and processing of minerals (Nguyen, T. P. and Nguyen, T. D., 1997).

A new foreign investment decree was issued in 1998. The decree disallowed 100% foreign-ownership in oil and mineral exploration projects, but eased licensing and export rules for export-oriented companies (Far Eastern Economic Review, 1998). Because of the Asian financial crisis and economic down turn, overall foreign investment in Vietnam decreased

significantly in 1997 and 1998. Foreign companies also were reluctant to make a major investment in Vietnam's mining industry. Since the new mining law became effective in 1996, the exclusive right of a successful exploration company to obtain mining license, the sole right of an exploration company to conduct exploration within its license's area, and the ability of a foreign mining company to export unprocessed minerals remained the major concerns of foreign investors in 1998 (SEG Newsletter, 1998).

The mining industry is a small but important subsector of the industrial sector in the Vietnamese economy. The output of the mining industry, excluding the oil and gas industry, contributed about 2% to Vietnam's gross domestic product (GDP) (Nguyen, T. P., 1997). However, the overall output of the mining industry, including the oil and gas industry, was estimated to have contributed about 7% to the country's GDP. Exports of coal, crude petroleum, and condensate, alone, contributed about 17% to the total export earnings. Vietnam's GDP was estimated at \$24.8 billion and the total export earnings about \$8.9 billion (The World Bank, 1998).

The mining industry comprised a state-owned nonfuel minerals company, a state-owned gem and gold company, a state-owned coal mining company, a state-owned oil and gas company, several joint ventures of the state-owned and foreign mining companies, many small-scale state-owned mining companies, joint ventures of local government and private mining companies, and local private miners. According to Mining Magazine, about 1,000 mines and quarries were operating in 1998. Mining operations in Vietnam used outdated technologies and unsophisticated equipment. Small-scale mining of coal, chromite, gemstone, gold, and tin commonly was by unorganized and unofficial companies (Chadwick, 1998).

In 1998, production of metallic minerals included chromite, gold, lead, pyrite, tin, tungsten, zinc, and zirconium. Production of industrial minerals included clays, construction aggregates, gemstones, ilmenite, limestone, phosphate rock (apatite), salt, and silica sand. Production of mineral fuels included coal, natural gas, and crude petroleum. Production of processed mineral products included cement, fertilizer materials, refined gold, steel, and refined tin. (*See table 1.*) Most mineral production were processed and consumed domestically. However, most chromite, ilmenite, crude petroleum and condensate, and zirconium production; and some production of kaolin, coal, granite, salt, silica sand, and refined tin were exported. The major import mineral products were refined petroleum products, primary aluminum, iron and steel, and fertilizer materials.

Mining of chromite by small-scale miners was at the alluvial deposits in the northeastern foothill of Nui Nua Mountain in Thanh Hoa Province, about 150 kilometers (km) south of Hanoi. Between 1990 and 1995, annual output of refractory-grade chromite from the area was between 4,500 and 9,100 metric tons (Nguyen, K. V., 1997).

The production of gold remained small. Gold mining by small-scale operators and local miners were at the placer deposits along the Gam, Lo, Bac Giang, Ma, Da, Hien, Ca Long Dai, and Hinh Rivers (Le, 1998). Illegal miners using mercury were common in various placer deposits along the rivers and had caused environmental damages to the forest and farmland (Chadwick, 1998). A joint venture of the Russian Geology Federation and Thai Nguyen Color Metal Co. of Vietnam, with an initial capital investment of \$1.6 million in 1994 reportedly was producing 500 grams per day of gold in the northern part of Bac Thai Province (Mining Journal, 1997).

In the past 3 years, gold exploration was conducted by joint ventures of the Government and foreign companies. The foreign companies with exploration licenses conducting gold exploration were Iddison Vietnam Group Ltd. in the Lang Son area; Indo-China Goldfields Ltd. in the Quang area; Kim Resources N.L. in the Lam Dong area; La Sources and Hindustan Zinc Ltd. in the Cao Bang area; Mindex ASA in the Dac Lac, Phu Yen, and Binh Dinh areas; Newcrest Mining Ltd. in the Thanh Hoa area; and Normandy Anglo-Asian Pty. Ltd. in the Lai Chau area (Truong, and Nguyen, K. D., 1997).

Mine production of pyrite was mostly from the Thai Nguyen deposit in Thai Nguyen Province and was consumed as raw materials for steelmaking by a local steel plant. Production of lead and zinc was mainly from the Cho Dien deposit in Bac Can Province and possibly from the My Due deposit in Quang Binh Province. Production of tin and tungsten was from the Pia Qac deposit, 338 km north of Hanoi; the Tam Dao deposit, 130 km north of Hanoi; and the Quy Hop deposit, about 250 km south of Hanoi. The output of tin and tungsten mostly was for domestic consumption, but some refined tin was exported to Malaysia to upgrade the tin purity from 99.7% to 99.85%.

During the past 3 years, several foreign companies, in joint venture with the Government, were exploring for nonferrous metals in Vietnam. Auridiam Consolidated Co. Ltd. and North Star Resources Co. Ltd. were exploring for copper and gold in the Shin Quyen area of Lao Cai Province. Golden Tiger Resources NL was exploring for lead and zinc as well as manganese dioxide in the Na Tum area of Bac Can Province. Tiberon Minerals Ltd. was exploring for lead and zinc in the Coi Ky area of Bai Thai Province. Padaeng Industries Co. Ltd. was exploring for copper, lead, tin, and zinc in the Cho Dien and Na Tum areas of the Bac Can Province. Palmer Resources Ltd. was exploring for copper in the Cam Son, Lang Cha, and Bien Dong areas of Bac Giang Province. Spectrum Resources Co. Ltd. was exploring for copper and nickel in the Ban Phu area of Son La Province (Le, 1998).

Production of kaolin was from the Red River, Quang Ninh, Hai Hung, Binh Tri Thien, Da Lat, and Nai areas. Most of the kaolin output was consumed domestically as raw materials for making porcelain and paper. Production of silica sand was from the Van Hai deposit along Ha Long Bay, about 110 km

from Hai Phong Port; the Thuy Trieu deposit on the Cam Ran Peninsula; and the Nam O deposit, about 16 km north of Da Nang. Production of salt was mainly from the Khanh Hoa and Ninh Thuan areas. The major salt producers were Cam Ranh Salt Enterprise in Cam Ranh Town, Khanh Hoa Province; Cana Salt Enterprise in Ninh Phuoc District, Ninh Thuan Province; Dien Hai Salt Enterprise in Ninh Hao District, Khanh Hoa Province; Phuongguu Salt Enterprise in Ninh Hai District, Ninh Thuan Province; and Salt Co. No. 1 in Hai Hua District, Nam Ha Province. Production of phosphate rock (apatite) was from the Lao Cai area, west of the Red River. Most of the apatite production was shipped as raw materials to the Lam Thao fertilizer plant in Phu Tho Province for manufacture of superphosphate (Le, 1998).

Production of ilmenite and zirconium was from the Cat (Ky) Khanh Mine in Binh Dinh Province and other coastal placer deposits in the Ky Ninh, Quang Ngan, Vin My, and South Ham Tan area. The major producers of ilmenite and zirconium were Bimal Minerals Co. (BIMICO) and Institute of Industrial Chemistry. BIMICO is a joint venture of the state-owned Binh Dinh Minerals Co. (40%) and Malaysia Mining Corp. (60%). Most output of ilmenite and zirconium was exported mainly to Japan.

Production of gemstones was from the Lam Dong, Luc Yen, Nghe An, Quy Chau, and Yen Bai areas. The Vietnam National Gem and Gold Corp. operated gemstones mines in the Yen Bai and Tay Nguyen areas. Gemstones produced from these areas were mainly ruby and sapphire. The company was expected to bring on-stream two new sapphire mines at the Khe Ngang and Truc Lau areas in Nghe An Province in late 1998 or early 1999 (Mining Journal, 1998).

Production of limestone for cement and lime manufacturing was from the Chan Doc, Hai Duong, Hoa Binh, Kien Giang, Nam Ha, Quang Ninh, Quang Binh, Quang Tri, Thanh Hoa, and Thua Thien areas. The major limestone producers were Campha Limestone Enterprise in Cam Pha Town, Quang Ninh Province; Kien Giang Limestone Exploitation Enterprise in the Ha Tien District, Kien Giang Province; and Limestone Enterprise No. 1 in Ha Nam Town, Nam Ha Province.

Production of cement was by the state-owned Vietnam National Cement Corp. (VNCC). VNCC owned and operated a 1.2-million-metric-ton-per-year (Mt/yr) plant in Bim Son, Thanh Hoa Province; a 1.4-Mt/yr plant in But Son, Nam Ha Province; a 1.2-Mt/yr plant at Ha Tien-I in Ho Chi Minh City; a 1.5-Mt/yr plant at Ta Tien II in Ha Tien, Kien Giang Province; a 0.45-Mt/yr plant at Hai Phong in Hai Phong City; and a 2.3-Mt/yr plant at Hong Thach in Kim Mon, Hai Hung Province (Cembureau, 1996). Because of the serious environmental pollution caused by the cement plants in urban areas, VNCC planned to move two old cement works—the Ha Tien-I and Hai Phong plants to other locations.

In the past 3 years, VNCC established several joint ventures with foreign companies to build large cement plants. In 1997, Ching Fong-Hai Phong Cement Corp., a joint venture of VNCC and Hai Phong City Government (30%), and Ching Fong Global Corp. of Taiwan (70%), completed construction and began operations of its 1.40-Mt/yr plant in Hai Phong City. In 1998, Morning Star Cement Ltd., a joint venture of VNCC's

Ha Tien Cement Co. (35%) and Holderbank Financiere Glaris of Switzerland (65%), inaugurated and started operations of its 1.76-Mt/y plant at Hon Chong in Kien Giang Province, about 400 km south of Ho Chi Minh City, and a cement packing and distribution terminal at Cat Lai, near Ho Chi Minh City (International Bulk Journal, 1999).

In February 1998, Nghi Son Cement Co., a joint venture of VNCC (35%) and Nihon Cement Co. and Mitsubishi Materials Corp. of Japan (65%), started construction of its 2.27-Mt/yr plant at Nghi Son in Thanh Hoa Province, about 200 km south of Hanoi. Nihon Cement Co. and Mitsubishi Materials Corp. reportedly had secured \$113 million loans from the International Finance Corp., the Asian Development Bank, and other private lenders (The Nikkei Weekly, 1998a). The new cement plant was scheduled for completion by June 2000. Limestone and clay requirements for the cement plant will be supplied from quarries in the Quynh Luu District, Nghe An Province, about 2.2 km south of the plant. This cement project in Vietnam will cost \$347 million (Industrial Minerals, 1998).

Vietnam National Coal Corp. controlled most of the country's coal mining, distribution, and export. Overall coal production of about 10.8 Mt in 1998 was from 10 open pit and 10 underground mines with capacity varying from 100,000 metric tons per year (t/yr) to 2 Mt/yr each, and several small-scale coal mines with a total output of less than 50,000 t/yr. Production of anthracite, concentrated in Quang Ninh Province, was mainly from the Cam Pha (open pit and underground), Hong Gai (open pit and underground), Mao Khe (underground), Mong Duong (underground), and Uong Bi (underground) areas in the northeastern part of Vietnam. Production of brown coal was mainly from two open pit mines in Northern Delta area with a capacity of less than 500,000 t/yr, each. The Vietnamese coal mining industry's capacity was estimated at 10.7 Mt/yr of raw coal and 8.4 Mt/yr of clean coal. Raw coal was washed and cleaned at three coal preparation facilities—the Cam Pha plant with a capacity of 2.5 Mt/yr, the Hong Gai plant with a capacity of 2.0 Mt/yr, and the Vang Danh plant with a capacity of 0.6 Mt/yr (Doan, 1997).

The Vietnamese anthracite has a high heating value of about 8,250 kilocalories per kilogram and a low ash and sulfur content. Vietnam consumed between 5 and 6 Mt/yr of coal and exported about 3.5 Mt/yr of coal, mainly anthracite. The major domestic coal consumers were the utilities and manufacturing industries. The major importer of Vietnamese coal (anthracite) was Japan.

Vietnam produced about 224,000 barrels per day (bbl/d) of crude petroleum and about 3.12 million cubic meters per day of natural gas in 1998 (Petroleum Economist, 1998b). Production of crude petroleum was from four offshore oilfields—the Bach Ho and Rong in Cuu Long Basin, the Dai Hung in the South Con Son Basin, and the Bunga Kekwa Oilfield offshore the southern coast of Vietnam between Vietnam and Malaysia. The Bach Ho and Rong Oilfields were owned and operated by VietSovPetro (VSP), a joint venture of Petrovietnam, the state-owned oil and gas company, and Zarubezhneft, a Russian oil company. VSP also owned and operated an onshore gasfield—the Tien Hai, near Hanoi and brought ashore associated gas from the Bach Ho Oilfield. The Dai Hung was

owned and operated by a joint venture of Malaysia's Petronas Carigali Sdn. Bhd. (63.75%), Petrovietnam (15%), France's Total (10.625%), and a Japanese consortium (10.625%) led by Japan National Oil Corp. and Sumitomo Corp. The Bunga Kekwa was owned and operated by a joint venture of Malaysia's Petronas (46%), Canada's International Petroleum Development (26%), Sweden's Sands Petroleum (15.5%), and Petrovietnam (12.5%).

In 1998, Japan Vietnam Petroleum Corp. (JVPC) brought on-stream the Rang Dong Oilfield in a shallow water Block 15-2 in the Cuu Long Basin. The output of the oilfield reached a peak level of 45,000 bbl/d in 1998 (The Nikkei Weekly, 1998b). JVPC is a consortium of Japan National Oil Corp. (49.3%), Mitsubishi Oil Co. (46.9%), Mitsubishi Corp. (3.5%), and Mitsubishi Petroleum Development Co. (0.3%).

To build and operate the country's first oil refinery, the Government of Vietnam, through its state-owned Petro Vietnam, signed an agreement with a Russian oil company, Zarubezhneft, in May 1998. Construction work on the oil refinery at the Dung Quat industrial estate in the central Quang Ngai Province was started in early 1998 and was scheduled for completion in 2001. The \$1.5 billion oil refinery will have a production capacity of 6.5 Mt/yr of refined petroleum products, including gasoline, diesel oil, liquefied petroleum gas, and propylene (The Nikkei Weekly, 1998c).

By the end of 1998, site clearance was completed at a cost of \$2.4 million, the \$15 million work on infrastructure outside the fence of the refinery complex was started in late 1998, and the \$41 million construction work on infrastructure inside the perimeter was expected to begin in 1999. According to Government officials, Petro Vietnam was expected to provide \$600 million to the project with external borrowing of \$400 million and the remaining from other sources (The Journal of Commerce, 1998). A consortium of Russian contractors led by Dzerzhinskhimmas was expected to build the oil refinery and Foster Wheeler of the United States was expected to provide the technology (Petroleum Economist, 1998a).

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Major Source of Information

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Major Publication

The Ministry of Industry, Department of Management of Mineral Resources, Production of principal minerals and metals in Vietnam, 1993-95.

TABLE 1
VIETNAM: PRODUCTION OF MINERAL COMMODITIES 1/

(Metric tons unless otherwise specified)

Commodity 2/	1994	1995	1996	1997	1998 e/	
Bauxite, gross weight	-- r/	-- r/	-- r/	-- r/	--	
Cement, hydraulic	thousand tons	4,700 e/	5,200 e/	6,600 r/	7,500 r/	6,000
Chromite, gross weight		6,300	9,100	3,500 e/	3,500 e/	3,500
Clays, kaolin e/		1,000	1,000	1,000	1,100	1,100
Coal, anthracite	thousand tons	6,100 e/	7,660 r/	9,800 r/	10,650 r/	10,800
Gas, natural, gross	million cubic meters	697	711	830	705	1,100
Gold	kilograms	54 r/	72 r/	1,000 r/ e/	1,000 r/ e/	1,000
Gypsum		-- r/	-- r/	-- r/	-- r/	--
Ilmenite, gross weight e/		32,000	50,000	50,000	50,000	80,000
Lead, mine output, Pb content e/		16,600	1,000	1,000	1,000	1,000
Nitrogen, N content of ammonia		53,500 r/	54,000 r/	54,000 r/	54,000	32,900
Petroleum, crude	thousand 42-gallon barrels	51,100	64,605 r/	63,510 r/	65,773 r/	83,000
Phosphate rock:						
Gross weight	thousand tons	470	600 r/	475 r/	834 r/	860
P ₂ O ₅ content	do.	144	181 r/	143 r/	250 r/	258
Pyrite, gross weight	do.	121	151	150 e/	150 e/	150
Salt e/	do.	375	375	375	390	400
Silica sand	do.	13,200	15,400	16,000 e/	20,000 e/	50,000
Stone:						
Building stone	do.	9,400	19,000	20,000 e/	22,000 e/	23,000
Limestone	do.	6,700	15,400	16,500 e/	17,500 e/	18,000
Steel, crude	do.	301 r/	271 r/	311 r/	314 r/	320
Tin:						
Mine output, Sn content e/		4,000	4,500	4,500	4,700	5,000
Metal, smelter		2,300 r/	2,400 r/	2,300 r/	2,400 r/	2,400
Tungsten, mine output, W content e/		--	50	130	210	60
Zinc:						
Mine output, Zn content e/		11,900 r/	14,000 r/	16,000 r/	18,000 r/	18,000
Metal, smelter, primary		-- r/	-- r/	-- r/	-- r/	--
Zirconium e/		--	400	500	800	600

e/ Estimated. r/ Revised.

1/ Table includes data available through July 14, 1999.

2/ In addition to the commodities listed, bauxite, refractory clay, construction aggregates, granite, graphite, iron ore, marble, and gemstones were mined, but not reported and available information is inadequate to make reliable estimates of output levels.

Sources: Ministry of Industry, State Department for Management of Mineral Resources; British Geological Survey, World Mineral Statistics, 1992-96; World Metal Statistics, 1998; International Iron and Steel Institute, Steel Statistical Yearbook, 1998; and International Petroleum Encyclopedia, v. 31, 1998.