

## THE MINERAL INDUSTRY OF

# THAILAND

By Pui-Kwan Tse

Since the economic and financial crisis that began in Thailand more than a year ago engulfed East Asia in 1998, the Thai Government economic reform program under the International Monetary Fund (IMF) set a priority on restoring external balance, stemming capital outflows, and reviving confidence in the baht. Growing political and economic uncertainty in neighboring countries affected the investors' confidence on the stability in the region. Capital outflows continued in the first half of the year. Regional turmoil diminished any hopes that Thailand would achieve a rapid economic rebound. Under the IMF tight monetary policy, the baht became more stable at yearend and interest rates came down; however, the 1998 gross domestic product (GDP) was about 8% in 1998 less than that of 1997. Finally, the economy showed signs that the recession had reached the bottom at yearend and the Government projected a 1% growth in 1999 (Asian Chemical News, 1999a).

Even though the country's current account had a healthy surplus, Thailand's financial crisis was not over. In 1997, the Government closed down 56 financial companies. The Financial Sector Restructuring Agency was created to auction off their assets. In 1998, the Government took over several banks with a total of nonperforming loans more than 2 trillion baht (the average exchange rate was about 41.2 baht for US\$1.00 in 1998) and established the Corporate Debt Restructuring Advisory Committee to facilitate debt restructuring. It probably would take more than 2 years for the Government to restructure and recapitalize the financial sector. With the tight monetary policy imposed by the IMF, business activities were in recess and traders had difficulties to obtain letters of credit or funds to replenish supplies. Consumers, wary of job security, cut back sharply on new purchases. Owing to mass layoffs of industrial workers, unemployment increased sharply from 1 million in 1997 to more than 2 million in mid-1998 and many of the unemployed workers returned to the rural areas (Far Eastern Economic Review, 1999).

In August, the Council of Economic Ministers approved an economic plan aiming to stimulate the economy. The plan included increasing Government spending in 1999 budget, relaxing monetary measures to increase liquidity for production sector through financial institutions, extending credit for consumption and trade in the private sector, and increasing the production in the agricultural sector. The Government also planned to restructure the manufacturing sector in order to improve competitiveness, create more job opportunities in rural communities and border areas, and draft more friendly foreign investment regulations (Far Eastern Economic Review, 1999).

In 1998, the Government drafted a package of reform legislation including provisions to establish a bankruptcy court system that would speed up bankruptcy and foreclosure proceedings and allow creditors to pursue payment from loan guarantors. The reform package would be submitted to the Parliament for approval in 1999. In addition, the Government also submitted bills to give the Bank of Thailand more independence, to set up a deposit insurance scheme, and to strengthen and modernize financial institutions. Under the newly approved Foreign Business Bill that replacing the Alien Business Law, foreign ownership and participation in many sectors were expanded (Asian Chemical News, 1999b).

Despite rapid growth in the industrial and service sectors, about 48.4% of the Thai work force was still engaged in agriculture. Thailand's education system remained geared toward the needs of a largely agrarian and traditional economy. The Government has made great progress over the last two decades in providing basic education; however, mandatory education is only through grade six. A new national education bill was submitted to the Parliament, which would give the right to free education for at least 12 years. The new Labor Protection Act went into effect on August 20, 1998. The Act raised the minimum age for employment in Thailand from 13 to 15. When Thailand's economy recovers, highly skilled and experienced workers with at least with a secondary education will be in short supply (U.S. Embassy, Bangkok, Thailand, 1999, 1998 country report on economic policy and trade practices: Thailand, accessed September 15, 1999, at URL <http://usa.or.th.embassy/cr-eptp98.htm>).

Thailand continued with its tariff reform to conform with World Trade Organization requirement. In January 1998, the tax rates for petrochemicals decreased from 27% to 23.5%; plastic pellets, from 40.5% to 30%; and other plastic products, from 40.5% to 35.25%. Thailand required import licenses for 26 categories of items, including raw materials and petroleum, industrial, textile, and agricultural products (U.S. Embassy, Bangkok, Thailand, 1999, 1998 country report on economic policy and trade practices: Thailand, accessed September 15, 1999, at URL <http://usa.or.th.embassy/cr-eptp98.htm>). In 1998, Thailand's total trade was 4.04 trillion baht, an increase of 24% from that of 1997. Exports accounted for 2.24 trillion baht, an increase of 24% from the previous year and imports valued at 1.80 trillion baht, a decline of 8% compared with 1997. In terms of U.S. dollars, owing to the depreciation of currency, the country's exports amounted to \$54.4 billion, a drop of 4% and imports fell 33% to \$42.4 billion. In terms of value, Thailand's mineral exports increased by 77% in the first half of 1998. Much of the increase was because of the

depreciation of the baht against the U.S. dollar. Owing to the slowdown in domestic demand, export volumes of tin and zinc rose 49% and 196%, respectively, compared with those of 1997 (Bangkok Post, September 25, 1998, High costs could curb growth, accessed October 21, 1998, at URL [http://www.bangkokpost.net/250998/250998\\_Business11.html](http://www.bangkokpost.net/250998/250998_Business11.html)).

Owing to the Asian financial crisis and the slowdown in domestic demand, manufacturing production declined in 1998. The construction sector was suffering from liquidity problems resulting from an industry downturn and overbuilding capacity. The automobile industry was scaling back operations as consumer demand weakened. The sluggish demand for metals was expected to continue until the first half of 1999. Mining and quarrying sectors accounted for less than 1.5% of the GDP and employed less than 30,000 workers. Based on value, lignite, limestone, and gypsum were the highest among 40 minerals produced in Thailand. About 90% of mineral production was consumed domestically. The Government planned to promote Thailand as an international center for gem and jewelry manufacturing and trading. Jewelry and precious-metal manufacturing and refining companies would receive income tax exemption for 8 years regardless of their location in the country for projects submitted before December 31, 1999.

Owing to the drastic contraction in domestic market, Thailand's cement companies were lack of liquidity, especially those plants with high interest payments. Many cement companies such as Jalapraphan Cement Plc. (JCC), Siam Cement Group, Siam City Cement Public Co. Ltd. (Siam City Cement), and TPI Polene were searching for potential new partners to strengthen their capital funds and to increase their competitiveness in cement market in the region. Domestic cement demand had declined from around 35 million tons (Mt) in 1997 to about 21 Mt in 1998. Asia Cement Plc. postponed its plan to build a 4 Mt cement plant in southern Thailand indefinitely because of the large cement surplus resulting from the economic crisis in the region.

Holderbank Financiere Glaris Ltd. of Switzerland acquired a 24.99% interest in Siam City Cement in August 1998. Siam City Cement had three cement plants located in the Sarabourri Province, each with two kilns, with a combined total output capacity of 12.3 million tons per year (Mt/yr). Siam City Cement operated its own distribution network of more than 100 units throughout the country and had a share of about 25% in the domestic market (Asian Wall Street Journal, 1998).

Ciments Francais of France paid about 1 billion baht to take 53% stake in JCC in late 1998. The money was used to pay creditors. Ciments Francais proposed to assist JCC to overhaul its Ta-Kli plant in Nakhon Sawan, which was scheduled to be completed in mid-1999. Domestic industry analysts believed that JCC had the highest production costs of all listed cement companies in Thailand. Most of its equipment was in need of replacement and JCC's total output capacity was less than 2 Mt in Cha-am and Ta-Kli plants (Bangkok Post, January 13, 1999, Profit in five years, says JCC, accessed January 19, 1999, at URL [http://www.bangkokpost.net/1301999/1301999\\_Business04.html](http://www.bangkokpost.net/1301999/1301999_Business04.html)).

Owing to a lack of funds, Thai Copper Industries (TCI)

rescheduled the startup of its 165,000-metric-ton-per-year copper smelter-refinery project until mid-2000. Seventy percent of the work had been completed by March 1998; however, because of the devaluation of Thai currency, TCI ran out of funds to complete the project. TCI required a further \$240 million to complete the project. After completion in 2000, the plant would initially operate on 65% of its capacity (Metal Bulletin, 1998a).

After more than 12 years of prospecting, Akara Mining Co. and Thungkum Ltd. announced the discovery of gold deposits in central and northeast Thailand. The two companies planned to apply for licenses to develop gold deposits in the area. Akara Mining, which Kingsgate Consolidated NL of Australia had a 90% stake while Banpu Plc. held 10%, estimated gold reserves at about 16.3 metric tons in the provinces of Pichit and Petchaboon. Thungkum Ltd., an affiliate of Tongkah Harbour Group, held a concession for gold exploration in 1,309-rai (the rai equals approximately 0.395 acre) in Loei (Bangkok Post, February 13, 1999, Northeast gold find worth B7.2bn, accessed February 18, 1999, at URL [http://www.bangkokpost.net/130299/130299\\_Business07.html](http://www.bangkokpost.net/130299/130299_Business07.html)).

The slow demand in construction and automobile sectors and the Government's tight monetary policy, local consumption of steel had decreased to about 6.5 Mt, a decline of more than 50% from 1996. Facing stiff competition from imported steel products, oversupply in the domestic market, and the lack of export potential, many local steel producers were at the brink of bankruptcy. The Iron and Steel Industry Club of the Federation of Thai Industries reported that about 50% of Thai's steel plants had been shut down and many workers were laid off (Metal Bulletin, 1998c). Several steel producers had tried to export their products to reach beyond the troubled local market; however, steel prices in the region had declined so dramatically in 1998 and they had difficulties competing in terms of price with producers in China, Eastern Europe, and the Republic of Korea who imported less raw materials for production. Thailand's four major steel producers—Bangkok Steel Industry Public Co. Ltd., Namhang Steel Co. Ltd., NTS Steel Group Public Co. Ltd., and Siam Cement Group's steel subsidiaries planned to consolidate or merge operations in order to reduce production costs. The consolidation aimed to strengthen local competitiveness against imported steel (Bangkok Post, March 6, 1999, Steel millers look at ways to reduce production costs, accessed March 25, 1999, at URL [http://www.bangkokpost.net/060399/060399\\_Business04.html](http://www.bangkokpost.net/060399/060399_Business04.html)). In November 1998, Siam United Steel, a joint venture of a Japanese consortium including Nippon Steel, Kawasaki Steel, and Siam Cement Group, commissioned its 20 billion baht, 1-Mt/yr cold-rolled steel plant located at Map Ta Phut, Rayong Province. The plant had the capability to produce three types of cold-rolled steel for automobile and electric appliances manufacturing. The blackplate was produced from the five-stand Hitachi cold-rolled mill for which Nippon Steel and Kawasaki Steel supplied the technology and was shipped to two tinsplate producers, Thai Tinsplate Manufacturing and Siam Tinsplate. The mill had the capability to produce sheet from 0.18 to 1.6 millimeters (mm) thick and 700 to 1,300 mm wide (Metal Bulletin 1998b).

Owing to the decline in global iron and steel prices,

Nakornthai Strip Mill Public Co. Ltd. (NSM) announced that the construction of its 1.5-Mt/yr direct-reduced-iron facility located in Chonburi would be delayed indefinitely. The startup of the new thin-slab/flat-rolled steel minimill would be delayed until mid-1999. The modifications included consolidating two pickling operations into one, establishing a cold mill instead of a single in-line reducing stand at the hot mill, and developing of a conventional galvanizing line from a heat induction coating facility that would reduce operation downtime and increase production flexibility. The modified equipment was supplied by SMS Schloemann-Siemag Inc. and Steel Dynamics Inc. (SDI) of the United States. SDI also provided technical and advisory services to NSM. On December 31, 1998, SDI informed NSM that the company would terminate the management and technical services agreement but would remain a shareholder in the company. SDI received a 10% stake in NSM in exchange for advising on the thin slab sheet production (Nakornthai Strip Mill Public Co. Ltd. press release, January 15, 1999, accessed January 19, 1999, at URL [http://biz.yahoo.com/prnews/990115/ny\\_nakornt\\_1.html](http://biz.yahoo.com/prnews/990115/ny_nakornt_1.html)).

The Thailand Government agreed to guarantee a \$413 million loan for the Association of Southeast Asian Nations (ASEAN) that sponsored a potash mine and processing plant in Bamnet Narong, Chaiyaphum. The potash project was under the ASEAN Industrial Project, which was established in 1976. Seven years ago, Asean Potash Co. (APC) was formed with registered capital of 913 million baht. Thai companies had a combined 71% stake in the project. Five other ASEAN members—Brunei, Indonesia, Malaysia, the Philippines, and Singapore—held the remaining shares. The Japanese Government had agreed to lend the funds for the project via the Japan Export and Import Bank and the Oversea Economic Cooperation Fund. APC completed the first phase construction work and would require an additional of \$413 million for the second phase construction. The project was scheduled to be completed in 2001 and was expected to produce 1.1 Mt/yr of potash for 30 years. In addition, 2.1 Mt/yr of salt would be mined (Bangkok Post, October 1, 1998, State guarantees potash mine loan, accessed October 21, 1998, at URL [http://www.bangkokpost.net/011098/011098\\_Business11.html](http://www.bangkokpost.net/011098/011098_Business11.html)).

Norsk Hydro ASA of Norway, through its subsidiary Norsk Hydro Asia Pte Ltd. and Asian Pacific Resource Ltd. (APR) of Canada, signed a memorandum of understanding to form a partnership for developing the potash deposit in Udon Thani. APR held a 90% interest in the concession and Asia Pacific Potash Corp. (APPC), a private Thai company, had the remaining. APPC would operate the mining and processing facilities at the Somboon Mine and would develop the Udon Mine (Industrial Minerals, 1998).

In 1998, Padaeng Industry Plc rescheduled its 3.4 billion baht debt with a consortium of nine Thai and Western banks. The rescheduling allowed Western Metals Ltd. of Australia to have time to acquire more shares in Padaeng. In 1997, Padaeng suffered a loss of 2 billion baht, mainly from foreign exchange losses. In the last several years, the Padaeng's zinc smelter only received 20% of its concentrates from its Mae Sod Mine, while the remaining was imported from Burma, China, and

Vietnam. Padaeng had applied three additional prospecting licenses covering a total of 30,000 rai in Tak Province from the Government. The discussion between Padaeng and its counterpart in Burma to evaluate zinc resources occurring within a belt that extended from Burma to Thailand was postponed because of inadequate infrastructure in that area (Mining Journal, 1998).

Reflecting the country's economic downturn, petroleum consumption continued to contract in 1998. The demand of petroleum, excluding that used by the petrochemical sector, shrank about 10% from 1997 level. Consumption of refined products fell more than 11%, to about 650,000 barrels per day. Total import volume of petroleum dropped by about 10%. Approximately 70% of Thailand's total petroleum supply was imported and more than 70% of its crude oil was imported from the Persian Gulf. Reflecting on an environmental awareness and the greater availability of natural gas from the Gulf of Thailand, daily demand for natural gas rose by more than 3%. Also, the price of natural gas became more competitive with other fuels.

The Petroleum Authority of Thailand (PTT) asked the Yadana Gasfield developing group, led by Total S.A. of France, to reduce the delivery volume of natural gas to the Electricity Generating Authority of Thailand's Ratchaburi powerplant. Under the 30-year contract signed with the Yadana consortium, PTT was committed to purchase up to 14.9 million cubic meters per day of gas from Yadana, 15 months after production startup on July 1, 1998. Because of the delay on the installation of gas turbines at its powerplant, PTT was only able to receive about one-thirteenth of the gas under the contract. The Yadana Gasfield is 240 kilometers (km) south of Rangoon in the Gulf of Martaban. The Yadana project was a joint investment of Total (31.24%), Unocal Corp. of the United States (28.26%), PTT Exploration & Production of Thailand (PTTEP) (25.5%), and Myanmar Oil & Gas Enterprise of Burma (15%).

PTT requested the consortium led by Premier Oil plc. of the United Kingdom to defer the delivery date of natural gas from the Yetagun field, about 270 km west of Thailand in the Gulf of Martaban. The construction of the east-west gas line from Ratchaburi to Wang Noi was scheduled to be completed by the end of 1999; however, news reports indicated that completion might be delayed. A new domestic pipeline link to the PTT's natural gas grid was still under construction. Otherwise, all the offshore gas from Burma would only arrive at Ratchaburi powerplant. The powerplant's capacity was not large enough to use all the gas from Yadana and Yetagun fields (Bangkok Post, October 23, 1998, New delays damage all parties, accessed October 27, 1998, at URL [http://www.bangkokpost.net/231098/231098\\_Business04.html](http://www.bangkokpost.net/231098/231098_Business04.html)).

Statoil of Norway sold its holding in the Bongkot Gasfield to a consortium of Total and British Gas Plc., and PTTEP. The Bongkot Gasfield was the largest gasfield discovered in the southern Gulf of Thailand, accounting for about one-third of the country's natural gas output. Also, Statoil was trying to dispose its 45% interest in block B10/32, which was operated by Unocal, and to terminate its involvement in two exploration licenses in blocks W8/38 and W9/28 in the Andaman Sea.

Chevron Corp. of the United States agreed to acquire 51.1% interest in block B8/32 from Rutherford Moran Oil Corp. of the United States and Palang Sophon of Thailand. Chevron would take over the operation in October 1999 from Pogo Producing Co. of the United States which held a 46.5% interest in the concession. Geologists believed that the block, located about 200 km offshore, has a significant oil and gas potential.

The falling value of the baht against the U.S. dollar and the shrinking domestic demand for oil caused Thai refiners financial losses in 1998. Refiners predicted more difficult times ahead as the financial crisis in the region continued in 1999. The National Energy Policy Office agreed to continue the policy that was approved by the cabinet in 1998 to allow refiners to reduce their oil reserves from 5% of their refining capacities to 3% in order to reduce their operating costs in 1999 (Bangkok Post, January 26, 1999, Reserve levels remain at 3%, accessed February 4, 1999, at URL [http://www.bangkokpost.net/260199/260199\\_Business12.html](http://www.bangkokpost.net/260199/260199_Business12.html)).

The Government decided to deregulate the trade of liquefied petroleum gas (LPG) in the country. PTT would be required to open up its LPG depots and bottling plants for a third party to access under the regulation. Under the Government approved PTT privatization plan, the LPG depot and bottling operations were separated (Bangkok Post, December 10, 1998, PTT likely to lose monopoly of LPG, accessed January 6, 1999, at URL [http://www.bangkokpost.net/101298/101298\\_Business05.html](http://www.bangkokpost.net/101298/101298_Business05.html)).

### References Cited

- Asian Chemical News, 1999a, Key to recovery: Asian Chemical News, v. 5, no. 211, April 5, p. 14.  
———1999b, Ratification of bills a mere formality: Asian Chemical News, v. 5, no. 209, March 22, p. 8.  
Asian Wall Street Journal, 1998, Swiss Holderbank buys key stake in Siam City Cement: Asian Wall Street Journal, August 17, p. 6.  
Far Eastern Economic Review, 1999, Thailand *in* Asia 1999 yearbook: Far

- Eastern Economic Review, p. 209.  
Industrial Minerals, 1998, Norsk Hydro joins potash project: Industrial Minerals, no. 371, August, p. 13.  
Metal Bulletin, 1998a, Thai Copper Industries resumes financing talks: Metal Bulletin, no. 8304, August 24, p. 5.  
———1998b, Thai CR mill starts up: Metal Bulletin, no. 8328, November 19, p. 22.  
———1998c, Thai re-rollers face brunt of market collapse: Metal Bulletin, no. 8299, August 20, p. 20.  
Mining Journal, 1998, Snags for Padaeng: Mining Journal, v. 331, no. 8499, September 25, p. 230.

### Major Sources of Information

- Department of Mineral Resources  
Ministry of Industry, Thanon Rama 6, Bangkok 10400, Thailand  
National Statistical Office  
Office of the Prime Minister, Larn Luang Road, Bangkok 10100, Thailand  
Mining Industry Council of Thailand  
132 Sinthorn Building, Room 11, Wireless Road, Bangkok 10500, Thailand  
The Electricity Generating Authority of Thailand  
52 Charan Sanit Wong Road, Bang Kruai, Nonthaburi 11000, Thailand

### Major Publications

- Bank of Thailand, Bangkok: Annual report.  
Department of Mineral Resources, Bangkok:  
Mineral Statistics of Thailand (annual).  
Metal Statistics of Thailand (annual).  
National Statistical Office, Office of the Prime Minister, Bangkok:  
Statistical Summary of Thailand (annual).  
Statistical Yearbook of Thailand (annual).

TABLE 1  
THAILAND: PRODUCTION OF MINERAL COMMODITIES 1/

(Metric tons unless otherwise specified)

Commodity	1994	1995	1996	1997	1998
<b>METALS</b>					
<b>Antimony:</b>					
<b>Ore and concentrate:</b>					
Gross weight	1,123	522	149	125	442
Sb content e/	500	230	70	60	200
Metal, smelter	1,424	577	949	782	750 e/
Cadmium	643	365	385	238	300 e/
Gold kilograms	96	103	32	--	--
<b>Iron and steel:</b>					
<b>Iron ore:</b>					
Gross weight	142,795	34,480	85,880	43,840	90,700
Fe content e/	78,000	17,000	43,000	22,000	45,000
<b>Metal, steel:</b>					
Crude thousand tons	1,391	2,134	2,143	2,430 e/	2,000 e/
<b>Ferrous alloys:</b>					
Ferromanganese	140	--	--	--	--
Silicomanganese	689	--	--	--	--
<b>Lead:</b>					
Mine output, Pb content of 42.5% Pb concentrate	7,950	9,680	21,000	5,280	6,430
<b>Metal, ingot</b>					
Primary	4,950	7,965	4,922	4,000 e/	5,000 e/
Secondary	11,953	11,150	12,789	15,080 e/	10,000 e/
Total	16,903	19,115	17,711	19,080	15,000 e/
<b>Manganese ore:</b>					
Battery- and chemical-grade, 75% MnO <sub>2</sub>	1,152	815	707	208	--
Metallurgical-grade, 46% to 50% MnO <sub>2</sub>	5,300	2,663	2,388	291	52
Total, gross weight	6,452	3,478	3,095	499	52
Total Mn content e/	3,100	1,600	1,550	260	25
Rare-earth mineral, Monazite concentrate, gross weight	57	--	--	12	--
<b>Tin:</b>					
Mine output, Sn content	3,926	2,201	1,457	756	2,124
Metal, smelter, primary	7,759	8,243	10,981	12,028	12,000 e/
<b>Titanium:</b>					
Ilmenite concentrate, gross weight	1,600	--	--	--	--
Leucosene concentrate, gross weight	77	33	--	--	--
Rutile concentrate, gross weight	49	--	--	--	--
<b>Tungsten concentrate:</b>					
Mine output, gross weight	93	92	67	54	56
Mine output, W content e/	40	60	30	25	25
<b>Zinc:</b>					
Mine output, gross weight	349,642	135,198	181,233	91,132	195,122
Mine output, Zn content	55,000 e/	28,787	11,375	8,894	19,563
Metal, smelter, primary	58,513	46,398	59,738	72,036	75,904
Alloy	12,586	10,509	12,643	12,018	15,078
Zirconium concentrate, gross weight	326	--	5	--	--
<b>INDUSTRIAL MINERALS</b>					
Barite	36,356	35,883	48,074	54,817	105,221
Cement, hydraulic e/ thousand tons	29,900 2/	34,900	35,000	35,000	21,000
<b>Clays:</b>					
Ball clay	329,286	308,001	386,334	288,406	206,172
<b>Kaolin, marketable:</b>					
Beneficiated	417,064	460,629	553,770	366,563	255,152
Nonbeneficiated	108,442	138,594	134,972	132,028	150,380
Filler	8,503	10,856	22,564	18,197	14,633
Diatomite	5,874	5,991	1,576	91	--
Feldspar	554,227	677,852	684,983	611,789	429,693
Fluorspar, crude, metallurgical-grade	23,705	24,114	17,247	7,826	23,788
Gemstones thousand carats	2,105	1,036	677	962	1,010
Gypsum thousand tons	8,140	8,533	8,934	8,858	4,334

See footnotes at end of table.

TABLE 1--Continued  
THAILAND: PRODUCTION OF MINERAL COMMODITIES 1/

(Metric tons unless otherwise specified)

Commodity	1994	1995	1996	1997	1998
<b>INDUSTRIAL MINERALS--Continued</b>					
Phosphate rock, crude	7,739	9,301	3,528	3,818	3,029
<b>Salt:</b>					
Rock	287,806	380,544	529,674	554,891	546,096
Other e/	100,000	100,000	100,000	100,000	100,000
Sand, silica	471,386	325,492	447,050	515,859	323,937
<b>Stone:</b>					
Calcite	23,300	37,700	32,700	29,550	12,250
Dolomite	744,847	668,795	1,064,699	803,511	535,301
Limestone for cement manufacture only	thousand tons 42,224	45,559	50,058	58,796	972
Marble	87,163	96,992	261,051 r/ 3/	332,839 r/ 3/	398,132 3/
Marl for cement manufacture only	561,600	610,600	566,500	9,543	6,995
Quartz, not further described	9,770	11,288	9,831	5,133	3,101
Shale for cement manufacture only	thousand tons 3,574	4,357	4,605	5,387	2,824
<b>Talc and related materials:</b>					
Pyrophyllite	55,326	76,189	64,330	304,524	40,241
Talc	8,950	4,252	7,238	7,139	1,972
<b>MINERAL FUELS AND RELATED MATERIALS</b>					
<b>Coal:</b>					
Anthracite	11,900	5,000	3,000	--	--
Lignite	thousand tons 17,100	18,419	21,685	23,443	20,162
Natural gas (gross production)	million cubic meters 10,723	11,389	13,123	16,159	17,545
<b>Petroleum:</b>					
Crude	thousand 42-gallon barrels 9,692	8,674	9,669	10,024	10,738
Natural gas condensate	do. 11,174	10,937	13,044	16,352	16,914
<b>Refinery products:</b>					
Liquefied petroleum gas	do. 14,470 r/	17,940	21,970	26,610	25,970
Gasoline	do. 12,940 r/	38,750	48,410	59,250	56,240
Jet fuel	do. 17,260 r/	19,740	22,460	23,970	22,800
Kerosene	do. 771 r/	710	1,190	771	734
Distillate fuel oil	do. 36,830 r/	37,740	52,540	54,740	50,140
Residual fuel oil e/	do. 22,500	22,500	23,000	24,000	22,000
Unspecified e/ 4/	do. 3,400	3,400	3,500	3,500	3,500
Total	do. 108,171 r/	140,780	173,070	192,841	181,384

e/ Estimated. r/ Revised.

1/ Includes data available through September 30, 1999.

2/ Reported figure.

3/ Cubic meter.

4/ Includes refinery fuel and refinery gains or losses.

TABLE 2  
THAILAND: STRUCTURE OF THE MINERAL INDUSTRY IN 1998

(Thousand metric tons unless otherwise specified)

Commodity	Major operating companies	Location of main facilities	Annual capacity e/
Antimony, concentrate	Associated Minerals Co. Ltd.	Bo Thang, 130 kilometers southeast of Bangkok, temporarily inactive	6
Do.	Parasit Mining Co.	Doi Ngoem, 100 kilometers southeast of Chiang Mai	2
Barite	American Thai Barite Co. Ltd.	Siam Mine, 200 kilometers southeast of Phuket	25
Do.	P&S Mining Co. Ltd.	Loei Mine, 10 kilometers northwest of Loei	70
Do.	STA Mining Co. Ltd.	STA Mine, 105 kilometers southeast of Chiang Mai	100
Cement	Siam Cement Co. Ltd.	Kaeng Khoi, 90 kilometers north of Bangkok	3,300
Do.	do.	Tambol Tabkwang, Kaeng Khoi District 90 kilometers northeast of Bangkok	2,800
Do.	do.	Tha Luang, 90 kilometers northeast of Phuket	3,200
Do.	do.	Thung Song, 130 kilometers east of Phuket	900
Fluorspar, concentrate	Phanom Thuan Mining Co. Ltd.	Phanom Thuan, 45 kilometers north of Kanchanaburi	60
Do.	Skt Minerals Co. Ltd.	Mine, 47 kilometers southeast of Krabi	65
Do.	Thai Fluorite Processing Co. Ltd.	Ban Lad, Phet Buri	120
Do.	United Fluorite Co. Ltd.	Salak Pra, 80 kilometers northwest of Kanchanaburi	26
Do.	Universal Mining Co. Ltd.	Mae la Luang, 120 kilometers west of Chiang Mai	35
Lead, concentrate	Kanchanaburi Exploration and Mining Co. Ltd.	Song Toh, 250 kilometers northwest of Bangkok	45
Steel, rolled	The Bangkok Iron and Steel Works Co. Ltd.	Phrapradaeng, Samut Prakarn Province	120
Do.	Bangkok Steel Industry Public Co. Ltd.	do.	180
Do.	NTS Steel Groups Public Co. Ltd.	Chon Buri Province	408
Do.	The Siam Construction Steel Co. Ltd.	Bangkok	500
Do.	The Siam Iron and Steel Co. Ltd.	Ban Moh, Sara Buri Province	400
Do.	Sahaviriya Group Corp. Ltd.	Bang Saphan, Prachuap Khiri Khan Province	2,400
Tantalum and niobium in tin slag	Thai Tantalum Co. Ltd.	Rayong	500
<b>Tin:</b>			
Concentrate	Numerous small companies	Offshore Andaman Sea from southern tip of Burma to south of Phuket	NA
Do.	do.	Mostly southern Thailand and along southern Burma border	NA
Refined	Thailand Smelting and Refining Co. Ltd.	Phuket	38
Tungsten, concentrate	Parasit Mining Co.	Doi Ngeom, 100 kilometers southeast of Chiang Mai	0.1
Do.	Siamerican Mining Enterprise Co. Ltd.	Khao Soon, 185 kilometers east of Phuket, temporarily inactive	1.2
Do.	Sirithai Scheelite Thailand Co. Ltd.	Doi Mok, 120 kilometers northeast of Chiang Mai, temporarily inactive	0.4
<b>Zinc:</b>			
Ore	Padaeng Industry Plc. Co. Ltd.	Mae Sot, Tak Province	350
Refined	do.	Tak, Tak Province	105

e/ Estimated. NA Not available.