THE MINERAL INDUSTRIES OF

CAMBODIA AND LAOS

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CAMBODIA

Cambodia's mineral resources have not been extensively explored and developed in the past two decades because of war, internal conflict, and the lack of appropriate mineral legislation and policy to attract foreign investors. As a result of the earlier geologic investigations and studies by French engineers and geologists, a wide variety of minerals had been identified in Cambodia. Metallic minerals identified were antimony, bauxite, chromium, copper, gold, iron ore, lead, manganese, molybdenum, silver, tin, tungsten, and zinc. Cambodia also has resources of coal and such industrial minerals as carbonate rocks, clays, fluorite, gemstones, phosphate rock, quartz, silica sand, and sulfur (Asian Journal of Mining, 2000a). Cambodia's maps of general geology and mineral resources distribution at a scale of 1:1,500,000 were published by the Department of Geology and Mines [Cambodia] in 1986 (Khoy Khim, Am Samruoch, and Chea Sochest, 1998). Resources of oil and gas offshore Cambodia in the Gulf of Thailand were known since early 1970. None of Cambodia's mineral resources were of world significance.

The mining sector, which was the smallest sector in the Cambodian economy, contributed only 0.16% to the country's gross domestic product (GDP). In 2001, Cambodia's GDP grew by 5.3% compared with 5.4% in 2000. The country's GDP and per capita GDP in 2001 were estimated to be $3.3 billion and $249, respectively. The Cambodian economy experienced deflation when its consumer price index dropped by 0.8% and 0.6% in 2000 and 2001, respectively (International Monetary Fund, 2002, p. 28, 35).

In 2001, Cambodia's mining activities included the production of crushed stones, sand and gravel, laterite blocks, phosphate rock, and quartz sand (Department of Mineral Resources Development [Cambodia], 2001). Most of the minerals production (except gemstones) was for domestic consumption. Gemstones were produced in the Pailin area and smuggled out of the country to Thailand. Quarrying of crushed stone and sandstone was in the Kampong Speu area and in several locations between Phom Penh and Takeo. Phosphate rock was produced mainly from the Tul Meas area, which is 45 kilometers (km) northeast of Kampot. Quartz sand was produced from the coastal areas to the north and southeast of Sihanoukville. The total workforce of the mining sector was about 4,000 in 2000 (Asian Development Bank, 2001a§[1]).

Cement manufacturing at the Chakreiting plant in Kampot Province, which had been operated by Naga Cement Ltd., reportedly ceased in 1998. Naga Cement (a group company of Holderbank Financiere Glaris Ltd. of Switzerland) imported ordinary portland cement from Siam City Cement Co. of Thailand. The imported cement was then distributed under the Bayon brand by Naga Cement to Cambodian market (Cambodia-Web, 2001§). The $80 million cement plant with capacity of 50,000 metric tons per year (t/yr) came onstream in Kampot Province in 2001. The new cement plant was a joint venture of Boon Ronng Group of Thailand and Yuan Wang Group of China (Associated Press, 1999).

In 2001, Cambodia continued to import all its requirements for petroleum products. Despite the potential for oil and gas resources offshore Cambodia, four foreign oil companies, which had signed exploration agreements with the Government in 1991 to explore for oil and gas in Cambodian territorial water offshore Sihanoukville in the Gulf of Thailand, had not discovered any oil, but did find a small deposit of natural gas in 1994. On the basis of the assessments by their geologists, potentially rich oil and gas resources were located in a 25,000-square-kilometer (km^2) overlapping claims area in the Gulf of Thailand. To resolve a 29-year dispute with Thailand, the Cambodian Government sent the Thai Government a joint-development proposal, which also included an agreement to split the total petroleum production evenly in January 2000 (Mekong Sources, 2000§). In 2001, the two Governments signed a memorandum of understanding for joint development in the overlapping claims area. A 2,600-km^2 area in the northern part of the overlapping claims area, however, remained in dispute because of a disagreement in determining the sea border (Far Eastern Economic Review, 2001).

The two Governments also could not reach an agreement on the terms of joint development regarding profit and production splits. Cambodia preferred a production-sharing contract similar to that of Indonesia and Malaysia, but Thailand favored a concession and tax royalty scheme. Another problem that omplicated the negotiations was about how to divide the exploratory blocks in the overlapping claims area held by foreign contractors. In the past several years, Cambodia and Thailand had each awarded blocks to three consortia to explore for oil and gas in the overlapping claims area (Mekong Sources, 2001§).

LAOS

Laos' mineral resources were barite, coal, copper, gemstones, gold, gypsum, iron ore, lead, silver, tin, and zinc. On the basis of limited geologic mapping and geochemical and geophysical surveys, 479 mineral occurrences on a 1:1,000,000-scale map were compiled by the British Geological Survey (United Nations Economic and Social Commission for Asia and the Pacific, 1995, p. 107). According to Laos' Department of

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

Geology and Mines, coal, copper, gemstones, gold, iron ore, lead, potash, tin, and zinc were earmarked for further exploration. Undiscovered mineral resources of iron ore, potash, and rock salt were believed to be substantial (Asian Journal of Mining, 2000b). None of Laos' mineral resources, however, were of world significance.

The mining sector, which was the smallest in the Lao economy, contributed 0.56% of the country's GDP in 2000. The GDP and per capita GDP were estimated to be $1.7 billion and $327, respectively (Asian Development Bank, 2001b§). In 2001, according to the Pathet Lao Daily, Laos' economy, as measured by the GDP, grew by 6.4% owing to increased production in the agriculture, industry, and service sectors (Embassy of Lao People's Democratic Republic, 2002§).

Laos' mining industry was dominated by the production of gypsum and tin. Other mineral commodities produced in Laos included barite, coal, construction materials, gemstones, gold, limestone, and zinc.

Gypsum was produced by the State Gypsum Mining Enterprise from the Dong Hene Mine in Savannakhet Province. Proven ore reserves at the mine were estimated to be 18 million metric tons (Mt) (United Nations Economic and Social Commission for Asia and the Pacific, 1995, p. 114). Gypsum production increased steadily in the past 4 years because of increased demand by the domestic cement industry and increased exports to Vietnam.

The State Tin Mining Enterprise produced tin mainly from the Nong Sun and Phon Thiou Mines in Nam Pathene Valley in Khammouane Province. Mined tin ore was concentrated at the Phon Thiou plant. All tin concentrate, which graded between 50% and 70% tin, was exported to Malaysia for smelting and refining.

After signing an agreement with the Lao Government in July 2000, Padaeng Industry Public Company Limited of Thailand began mining operations at the Kaiso deposit in the Vangvieng area, which is located north of Vientiane, in late 2000. All mined zinc ore, which totaled 15,935 metric tons (t) and averaged 32.39% zinc, was exported to Thailand for smelting and refining. The measured resources at the Kaiso deposit were estimated to contain 23,000 t of zinc using a cutoff grade of 20% zinc (Padaeng Industry Public Company Limited, 2001§).

In 2001, gemstones were produced mainly by the State Sapphire Mining Enterprise and individual miners from placers at the Ban Houei Xai (Huay Xay) in Bokeo Province. In 1994, the Government had signed an agreement with Gem Mining Lao PDR Co. Ltd. (GML) for the company to explore and exploit sapphire in a 72-km^2 area with a 15-year concession in Huay Xay in Bokeo Province. In 1996, GML discovered gem-quality sapphire. In 1997, the company started sapphire mining at Houai Sala 11 in Bokeo Province. During 1998 and 1999, sapphire production and cutting increased substantially. In 1999, a new processing plant, which had the capacity to wash 5,000 cubic meters per day of gravel, was completed at Houai Hong Nheng. A new cutting factory for quadrupling the cutting capacity was commissioned in Vientiane in 1999 (Minesite.com, 2001§).

In April 2000, Laos' Government terminated GML's mining concession because of misappropriation of funds. In May 2000, the Danish national owners of GML fled Laos to avoid imprisonment, and GML ceased operations pending a Government investigation of the exporting sapphires without proper Government authorization by GML's management. The Government reportedly raided the sapphire mine and seized 1.7 t of raw sapphires (Gemstone Forecaster, 2001). In December 2000, the Lao Government nationalized GML's sapphire mines and arrested an Australian couple on charges of illegally attempting to smuggle $52,000 out of the country in connection with GML (Elmore, 2001§).

In June, the Australian couple was sentenced to 7 years in prison after being found guilty of destruction of evidence, embezzlement at the sapphire mine, and tax evasion. As a result of intensive diplomatic and legal activities between Australia and Laos, the Australian couple were pardoned and released by the Lao Government in October after serving 3 months of their sentence. The Australian couple were accused by the Lao Government of being involved in the disappearance of about 130 kilograms (kg) of sapphire valued at $6.2 million, from GML's office in Vientiane. They were given amnesty but would have to pay more than $1 million in fines (Reuters Ltd., 2001§).

Laos' first cement plant with a capacity of 73,000 t/yr at Vang Vieng in Vientiane Province began production in 1994 (United Nations Economic and Social Commission for Asia and the Pacific, 1995, p. 122). Construction work on the country's second cement plant with a capacity of 200,000 t/yr in Vang Vieng was completed in 2001. According the Global Cement Report, cement production was estimated to be 92,000 t in 2001. Laos imported about 918,000 t of cement from Thailand to meet its domestic demand of about 1 Mt in 2001. The country also imported about 12,000 t of clinker in 2001 (International Cement Review, 2000).

Coal was produced by the State Coal Mining Enterprise (SCME) from the Chakeui Mine (anthracite) in Salavane Province, the Hongsa Mine (lignite) in Sayaboury Province, and the Muong Ngeum Mine (lignite) in Luangnamtha Province. All coal output was for domestic consumption mainly by the cement plant. SCME also produced barite from the Na Ang (Nalang) Mine in the Muong Feuang Valley in Vientiane Province. All barite output was exported to Thailand.

Oxiana Resources NL of Australia continued its exploration at its 80% owned Sepon copper-gold project (with 20% owned by Rio Tinto Plc) in northeastern Savannakhet Province in 2001. Oxiana Resources completed its drilling program in June and nearly completed a bankable feasibility study in October for the development of the Sepon copper-gold project; construction was to start in November 2001 (Mining Journal, 2001a; Vientiane Times, 2001§).

Oxiana Resources would initially focus on development of the gold reserves at its Sepon deposit and continue to explore for copper at the Khanong deposit of the Sepon project. According to the bankable feasibility study conducted by Batemen Engineering Pty. Ltd. of Australia, the estimated gold reserves would support an open pit mining operation with the capacity of 1.25 million metric tons per year (Mt/yr) of ore and a carbon-in-leach plant to produce up to 4,700 kilograms per year (150,000 troy ounces per year) of gold. The capital costs for the gold project, which excluded initial working capital, interest, and finance costs during construction were estimated to be $39.7 million (Mining Journal, 2001b).

Oxiana Resources released results of the latest drilling at the Khanong copper deposit of the Sepon project in April 2001. According to the company, the Khanong copper resources were estimated to be 48 Mt at a grade of 2.7% copper, of which 18.6 Mt was high-grade ore at a grade of 4.2% copper. The feasibility study on the Khanong copper deposit was expected to be completed by the end of 2001 (Australia's Paydirt, 2001; Metal Bulletin, 2001).

Pan Australian Resources N.L. (PARNL) had exercised an option in March to acquire 80% interest in Phu Bia Mining Ltd. (PBML) from Normandy Anglo Pte. Ltd. (NAPL) for $500,000 of shares in PARNL; PBML was a wholly owned subsidiary of NAPL [owned by Normandy Mining Ltd. (50%) and Anglo American plc (50%)]. The acquisition was pending Government approval for transfer of PBML shares and Government agreement to amend the mineral exploration and production contract to reflect favorable changes to tax rates and to allow an extension of exploration period. The Government approval of the acquisition, however, was delayed because of changes in the Laotian Government's senior officials. In its quarterly report to shareholders ending December 31, 2001, PARNL reported that an in-principle agreement had been reached and anticipated that the transfer of the PBML shares would proceed in early 2002 (Pan Australia Resources N.L., 2001a§, b§).

PBML's contract area, which is located 100 km northeast of Vientiane, has three gold deposits and one copper-gold deposit with drill-defined inferred mineral resources. The Long Chieng Track gold deposit has inferred mineral resources of 7 Mt at a grade of 1.8 grams per metric ton (g/t) gold; the Phu Kham gold oxide cap (the copper-depleted gold oxide zone of the Phu Kham copper-gold deposit), 9 Mt at a grade of 1.2 g/t gold; the Ban Houayxai gold deposit, 8 Mt at a grade of 1.7 g/t gold; and the Phu Kham copper-gold deposit (beneath the Phu Kham gold oxide cap), 125 Mt at a grade of 0.9% copper and 0.4 g/t gold. The combined gold metal content of the three oxide gold deposits was estimated to be 35,800 kg. The metal content of the Phu Kham copper-gold deposit was estimated to be 1.1 Mt of copper and 50,000 kg of gold (Pan Australian Resources N.L., 2001c§).

In July, the Laotian Government signed an agreement with the Yunnan Provincial Government of China for conducting a feasibility study to develop the potash resources in the Vientiane plain. According to a report by China Land and Resource News, the Yunnan Provincial Government planned to invest about $8.5 million to develop a mine with the capacity to produce 1 Mt/yr of potash. The feasibility study would take about 18 months (Zhongguo Guotu Ziyuan Bao, 2001).

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TABLE 1
CAMBODIA AND LAOS: PRODUCTION OF MINERAL COMMODITIES 1/

(Metric tons unless otherwise specified)

Country and commodity		1997	1998	1999	2000	2001 e/
Cambodia: 2/						
Cement, clinker e/		150,000 r/	150,000 r/	-- r/	-- r/	50,000
Gravel e/		12,000	12,000	13,000	12,800	13,000
Laterite, blocks		--	--	--	29,700	30,000
Phosphate fertilizer		1,000 e/	1,000 e/	741	3,617	3,600
Quartz sand		--	--	1,913	17,017	17,000
Sand, construction materials e/		600,000	600,000	700,000	690,000	700,000
Stones, crude construction materials		150,000 e/	150,000 e/	149,800	248,100	250,000
Salt e/		40,000	40,000	40,000	40,000	40,000
Laos: 3/						
Barite		7,330 r/	9,050	7,900 r/	1,100 r/	5,000
Coal, all grades		97,352	86,081	78,825 r/	121,317 r/	125,000
Cement e/		84,000	80,000	80,000	92,000 r/	92,000
Gemstones	carats	211,511	40,960	4,013,280 r/	150,000 e/	100,000
Gold, mine output, Au content	grams	24,755	--	--	--	--
Gypsum		114,306	130,250	134,745	147,720 r/	150,000
Limestone		113,855	68,892	66,549	67,000 e/	120,000
Salt, rock		1,800 e/	3,894	1,759 r/	1,542 r/	1,600
Tin, mine output, Sn content		717	627	404 r/	414 r/	400
Zinc, mine output, Zn content e/		--	--	--	60	120

e/ Estimated. r/ Revised. -- Zero.

1/ Table includes data available through April 5, 2002.

2/ In addition to the commodities listed, clay, gemstones, gold, iron ore, and lime presumably are produced, but available information is inadequate to make reliable estimates of output levels.

3/ In addition to the commodities listed, crude construction materials, such as sand and gravel and varieties of stone presumably are produced, but available information is inadequate to make reliable estimates of output levels.

Sources: Laos' Ministry of Industry and Handicraft. Asian Journal of Mining, Asian Mining Yearbook 11th edition, 2000, p. 13. Cambodia's Ministry of Industry, Mines and Energy. U.S. Geological Survey Minerals Questionnaire, 1999 and 2000.