THE MINERAL INDUSTRIES OF

CAMBODIA AND LAOS

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CAMBODIA

Cambodia, which borders the Gulf of Thailand on the north, Laos in the south, Thailand on the southeast, and Vietnam on the southwest in Southeast Asia, was one of the poorest and least developed countries in Asia and the Pacific region with a per capita gross domestic product (GDP) of $275. In the past 5 years, exploitation of its mineral resources had been limited to small-scale mining and quarrying of construction aggregates, phosphate rock, quartz, and sand and gravel and artisanal mining of gemstones and gold. The country's mineral resources largely remained unexplored and unexploited because of wars during the 1960s, 1970s, and 1980s and more recently because of the lack of capital, specialists, and technology. To attract local and foreign investment in Cambodia's mining sector, a new Law for Management and Mining of Mineral Resources was drafted in 1996 and approved by the Cabinet in 2000. The new Law was promulgated by the Government on July 13, 2001.

Mineral potential in Cambodia, as indicated by the Department of Geology and Mines, was for bauxite, coal, gemstones, gold, iron ore, kaolin, limestone, manganese, phosphate rock, quartz, silica sand, and tin (Asian Journal of Mining, 2000). Since 1993, the Ministry of Industry, Mines, and Energy reportedly had issued 11 licenses, 5 of which were for gold exploration. Gold exploration licenses were awarded to Sun Trading Co. Ltd. of the Republic of Korea; Delcom Cambodia Pte Ltd., which was a joint venture of Cambodian and Malaysian companies; Brewer Natural Resources Development Co. and Jupiter International Resources Cambodia of the United States; and Wang Fa Cambodia Investment Group of China. Gold exploration by Sun Trading was in a 122-square-kilometer (km^2) area of Memot, Kompong Cham Province and a 96-km^2 area of Memong, Mondul Kiri Province; Delcom Cambodia, in a 198-km^2 area of Krova, Kompong Thom Province, and a 216-km^2 area of Phnom Dek, Preah Vihea Province; the Brewer Natural Resources Development, in a 725-km^2 area of Oyadao Leu and a 504-km^2 area of Oyadao Krom, Modul Kiri Province; Wang Fa Cambodia Investment Group, in a 92-km^2 area of Pu Chu Leu, Mondul Kiri Province; and Jupiter International Resources Cambodia, in a 330-km^2 area of Oyadao and a 276-km^2 area of Banlung, Mondul Kiri Province (Asian Journal of Mining, 1999). In the past 10 years, no significant gold findings have been reported by the exploring companies or by the Government. The status of minerals exploration by foreign companies in Cambodia after the 1997 Asian financial crisis was unknown.

The mining sector, which was the smallest sector in the Cambodian economy, was estimated to contribute only 0.15% to the country's GDP. Cambodia's GDP growth was estimated to be 4.5% compared with 6.3% in 2001 owing to slower growth in the agricultural and garment sectors. According to the 2001 Labor Force Survey of Cambodia, the total workforce in the mining and quarrying sector was about 4,000 (International Monetary Fund, 2003, p. 51, 53, 84).

In the past 5 years, mining activities in Cambodia included the production of laterite blocks (bricks), phosphate rock, quartz sand, sand and gravel, crushed stone (construction aggregates). In 1995, gold and zircon reportedly were mined illegally in the Provinces of Kampong Cham, Mondol Kiri, and Rotanoh Kiri (GeoJAG Australia, 2003§[1]). Gemstones were mined at the Pailin Mine in Batdambang Province. Crushed stone and sandstone were quarried in the Kampong Speu area and in several locations between Phom Penh and Takeo. Phosphate rock was mined and processed in the Tul Meas area of Kampot Province or processed at a small plant in Batdambang Province. Quartz sand was produced from the coastal areas to the north and southeast of Sihanoukville.

Cement manufacturing at the Chak Krei Ting Cement Factory 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) continued to import ordinary portland cement from Siam City Cement Co. of Thailand. The imported cement from Thailand was then distributed under the Bayon brand by Naga Cement to the Cambodian market.

Cambodia continued to import all its requirements for refined petroleum products, which included gasoline, kerosene, and distillate and residual fuel oil. To explore for oil and gas resources offshore Cambodia in a 25,000-km^2 overlapping claims area in the Gulf of Thailand, the Cambodia National Petroleum Authority (CNPA) awarded block A, which is located about 120 kilometers offshore Cambodia, to a consortium of Chevron Overseas Petroleum Cambodia Ltd. (a subsidiary of ChevronTexaco Corp. of the United States) and Moeco Cambodia Co. Ltd. (a subsidiary of Mitsui Oil Exploration Co. Ltd. of Japan) in March 2002; ChevronTexaco owned 70% of the consortium, and Moeco, 30%. The block, which covers a 6,278-km^2 area in the Gulf of Thailand, adjoins ChevronTexaco's producing field in block B8/32 in the Gulf of Thailand and three exploration blocks 7, 8, and 9 in the overlapping claims area. In August 2002, the petroleum production-sharing contract (PSC), which covered block A, was officially signed between CNPA and Chevron, which was appointed as operator of the petroleum PSC, and Moeco Cambodia (Alexander's Gas & Oil Connections, 2002§; ChevronTexaco Corp., 2002§).

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

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LAOS

Laos, which borders Cambodia to the north, Burma to the southeast, China to the south, Thailand to the northeast, and Vietnam to the west in Southeast Asia, was one of the poorest and least developed countries in Asia and the Pacific region with a per capita GDP of $310. The aid-dependent economy remained underdeveloped because of slow progress on its New Economic Mechanism for economic reforms and liberalization, which was initiated in 1986. To promote and encourage foreign investment in the mining sector, a new Mining Law was promulgated by the Government on April 12, 1997, and fiscal incentives (tax holidays) for mineral exploration were also provided. By October 1998, 21 licenses had been issued to foreign companies; eight of these companies were to explore for construction materials (clay, granite, gypsum, limestone, and sandstone); five, gold; three, coal; two, tin; one each for oil and gas, sapphire, and zinc (Asian Journal of Mining, 1999). In 2002, a considerable amount of foreign investment reportedly was made in the mining, food processing, and textile industries (Far Eastern Economic Review, 2002).

According to Laos' Department of Geology and Mines, Laos' mineral potential included coal, copper, gemstones, gold, iron ore, lead, potash, salt, tin, and zinc. Geologic environments were favorable for discoveries of iron ore, potash, and rock salt, which were believed to be substantial (Asian Journal of Mining, 2000).

The mining sector, which was the smallest sector in the economy, was estimated to contribute 0.6% to the country's GDP. In 2002, Laos' GDP growth was estimated to be 5.8% compared with 5.7% in 2001 (Asian Development Bank, 2003§). Laos' mining activities were dominated by the production of gypsum and tin. Other mineral commodities produced in Laos included barite, coal, construction materials, gemstones, gold, limestone, and zinc. All mining activities in Laos were small scale and mostly owned and operated by the State-owned mining enterprises or by joint ventures of the State-owned companies and foreign companies.

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). Lanexang Gypsum Co. Ltd. (LGC), which had been exploring for gypsum in Laos since 1999, had developed a new gypsum mine with estimated reserves of 21 Mt in Savannakhet Province (Reywod Manawatao, senior mining engineer, Thai Gypsum Products Pcl, oral commun., 2002); LGC was a joint venture of the Laotian Government (30%) and Thai Gypsum Products Pcl. of Thailand (70%). The country's gypsum production was estimated to be about 130,000 metric tons (t) in 2002. Most of Laos' gypsum production was exported to Thailand and Vietnam. About 5% of gypsum production was consumed by domestic cement plants.

Tin was produced by two joint ventures between Laos and North Korea and Russia from the Nong Sun and the Phon Thiou Mines. Mined tin ore was concentrated at the Phon Thiou plant in the Nam Pathene Valley, Khammouane Province. All tin concentrate, which graded between 50% and 70% tin, was exported to Malaysia Smelting Corp.

After signing an agreement with the Laotian Government in July 2000, Padaeng Industry Public Co., Ltd. of Thailand began zinc mining operations at the Kaiso deposit in the Vang Vieng area in late 2000. All mined zinc ore was exported to Thailand for smelting and refining. Padaeng Industry (Laos) Co. Ltd. (a wholly owned subsidiary of Padaeng Industry) reportedly produced 1,000 t of zinc silicate ore with an average grade of 27.6% zinc from the Kaiso Mine in 2002. In 2002, Padaeng Industry applied to the Laotian Government for a 400-km^2 expansion of the exploration area until June 2006 (Padaeng Industry Public Co. Ltd., 2002§).

After completing an environmental and social impact assessment in September 2001 and a definitive feasibility study in October 2001, Oxiana Resources NL of Australia began development of its $45 million gold project near the town of Sepon in the northeastern part of Savannakhet Province in early 2002 and completed construction work at the end of 2002. The gold project was Laos' largest mining operation and the first with foreign capital and modern mining technology. The treatment plant would have an annual processing capacity of 1.25 Mt of ore and would produce at least 3,888 kilograms (kg) (125,000 ounces) of gold at a cash operating cost of about $150 per ounce and a mine life of about 8 years. The Sepong gold mining and processing operations were expected to begin in January 2003. According to Oxiana Resources, 2002 drilling results indicated total resources of more than 155 t (5 million ounces) of gold compared with an initial estimate of about 110 t (3.5 million ounces); reserves were estimated to be 29 t (932,000 ounces) of gold (Metal Bulletin 2002b, c).

The Sepon gold project was funded by $15 million in equity and $30 million in debt finance from the International Finance Corp. (IFC), which is an affiliate of the World Bank. Under the term of the agreement, the IFC would receive an undisclosed equity interest

in the Sepon gold project. Rio Tinto plc, which sold 80% of its interest in the Sepon project to Oxiana Resources in 2000, retained a 20% interest in the project (Mining Journal, 2002).

In late 2002, Oxiana Resources completed its bankable feasibility study for the development of the Khanong copper deposit, which is located east of the Sepon gold deposits. According to the feasibility study, Oxiana Resources planned to produce 60,000 metric tons per year of copper cathode by using solvent extraction-electrowinning processing technology. The Khanong copper deposit was estimated to have 26 Mt of resources at a grade of 4.1% copper, of which mining reserves were estimated to be 13.5 Mt at a grade of 5.1% copper. The capital costs, which excluded working capital and financing fees, were estimated to be $167 million. The initial mine life was estimated to be 11 years with capital payback period of 3 years. Construction work was scheduled to begin in late 2003 and to be completed by the end of 2004. Copper production was expected to start in March 2005 (Metal Bulletin, 2002a, b).

In March 2002, the Government of Laos approved the transfer of an 80% interest in Phu Bia Mining Ltd. (PBML) to Pan Australian Resources NL from Newmont South East Asia Pte. Limited (formerly Normandy South East Asia Pte Limited), the balance of 20% of the shares in Phu Bia Mining would be retained by Newmont. The share transfer, however, will still be subject to the receipt of a formal notification and the execution of an agreement that had been negotiated with the Government of Laos in 2002 (Pan Australian Resources NL, 2002a§).

By June 2002, an agreement with the Government of Laos and Newmont formalized the procedural basis for the transfer of 80% shares in Phu Bia Mining, which was party to a mineral exploration and production agreement (MEPA) with the Government of Laos. The share transfer was pending final Government approval of the amendments to the Foreign Investment License and Articles of Association of Phu Bia Mining so that Pan Mekong Exploration Pty Ltd. (a subsidiary of Pan Australian Resources) can be denoted as an 80% shareholder (Pan Australia Resources, 2002b§).

In 2002, Pan Australian Resources' drilling programs focused on the three shallow oxide gold deposits at the Ban Houayxai, the Phu Kham gold cap, and the Long Chieng Track, which are located along the main access road to the southern part of the Phu Bia contract area. According to Pan Australian Resources, the total resources of the three deposits contained more than 31 t (1 million ounces) of gold. Drilling at the Ban Houayxai deposit had increased the resource estimate to more than 15 t (500,000 ounces) of contained gold within 60 meters of the surfaces and had identified the potential for a very shallow resource of more than 31 t (1 million ounces) of gold at the Ban Houayxai deposit. At the Phu Kham gold cap deposit, reverse circulation drilling during 2002 identified the potential for the grade of gold resources in the oxide cap to increase. Pan Australian Resources also relogged the previously drilled diamond core holes at the Long Chieng Track deposit. At the Phu Kham copper-gold deposit, which underlies the Phu Kham oxide gold cap, Pan Australian Resources completed five reverse circulation drill holes in July 2002 and identified a potential underestimation of the overall resources tonnage and grade for that deposit by the previous operators. Previously, resources of the deposit were estimated to contain about 50 t (1.6 million ounces) of gold and 1.1 Mt of copper (Pan Australian Resources, 2002c§).

Wanrong Cement Plant One, which had a capacity of 73,000 t/yr in Vang Vieng and was Laos' first cement plant and the first Chinese-Laotian joint venture, marketed its cement under the Golden Bull brand. Wanrong Cement Plant Two had a capacity of 200,000 t/yr and began operation in March 2002; it is also located in Vang Vieng, which is about 150 kilometers north of Vientiane. According to a Chinese press report, Lao Cement Co., which was a Chinese-Laotian joint venture, owned the two cement plants. The domestically produced cement accounted to about 50% of the cement market in Vientiane, and Laos did not have to depend heavily on imported cement in 2002. China invested $36 million and provided the technical assistance for building the Wanrong Cement Plant Two; environmental control equipment was being used to curb emission of smoke and dust by 98% in the surrounding areas (People's Daily Online, 2002§).

In February 2002, the Government of Laos signed an agreement with Chinese investors to build the country's third cement plant; it will have a capacity of 200,000 t/yr and be located in Saravan Province. The Chinese investors would provide 100% financing of the $30 million plant. Under the agreement, the Chinese company would have a 30-year investment contract (ownership) before transferring its assets to the Government of Laos (Vientiane Times, 2002§).

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TABLE 1
CAMBODIA AND LAOS: PRODUCTION OF MINERAL COMMODITIES[1]

(Metric tons unless otherwise specified)

Country and commodity	1998	1999	2000	2001	2002[e]
CAMBODIA[2]					
Cement, clinker[e]	150,000	--	--	50,000	50,000
Gravel[e]	12,000	13,000	12,800	13,000	12,000
Laterite, blocks	--	--	29,700	30,000 [e]	30,000
Phosphate fertilizer	1,000 [e]	741	3,617	3,600 [e]	3,600
Quartz sand	--	1,913	17,017	17,000 [e]	18,000
Sand, construction materials[e]	600,000	700,000	690,000	700,000	700,000
Stones, crude construction materials	150,000 [e]	149,800	248,100	250,000 [e]	240,000
Salt[e]	40,000	40,000	40,000	40,000	40,000
LAOS[3]					
Barite	9,050	6,600 [r]	2,000 [r]	1,700 [r]	2,000
Coal, bituminous	86,081	78,825	126,290 [r]	103,223 [r]	110,000
Cement[e]	80,000	80,000	92,000	92,000	240,000
Gemstones carats	40,960	126,070 [r]	189,284 [r]	-- [r]	200,000
Gypsum	130,250	134,745	131,517 [r]	107,715 [r]	130,000
Limestone	68,892	66,549	221,600 [r]	367,300 [r]	360,000
Salt, rock	3,894	1,759	1,779 [r]	2,271 [r]	2,300
Tin, mine output, Sn content	627	404	408 [r]	343 [r]	350
Zinc, mine output, Zn content[e]	--	--	60	4,000 [r]	1,300

[e]Estimated; estimated data are rounded to no more than three significant digits. [r]Revised. -- Zero.

[1]Table includes data available through June 13, 2003.

[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 ed.), 2000, p. 13. Cambodia's Ministry of Industry, Mines and Energy. U.S. Geological Survey Mineral Questionnaire, 2000 and 2001.