



# 2011 Minerals Yearbook

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LAOS [ADVANCE RELEASE]

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# THE MINERAL INDUSTRY OF LAOS

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In 2011, Laos produced a variety of mineral commodities. These included tin, gypsum, and refined copper, of which production increased by about 83%, 24%, and 23%, respectively, compared with that of 2010. On the other hand, significant decreases in production were reported for silicon (61%), barite (29%), and gold (21%) (table 1).

In 2011, Sinohydro Group Ltd. of China signed a \$2 billion framework agreement with the Government of Laos to build seven dams along 475 kilometers (km) of the Nam Ou River, which is a Mekong River tributary. The agreement covered the initial stages of the project, which included the planning and discussion of the terms and conditions for the construction of the dams and not the actual construction of the structures. The agreement is part of the country's broader plan to build a total of 12 hydropower dams along the Mekong River, which is shared with neighboring countries Cambodia, Thailand, and Vietnam. Vietnam was publicly opposed to the construction of any dam along the Mekong River, citing irreparable environmental damage and the threat to the livelihood of the population living next to the river. The first of the 12 proposed hydropower dams, the Xayaburi, which was projected to cost \$3.5 billion, was to be built under an agreement with Thailand, which would purchase most of the electricity generated from the 1,260-megawatt (MW)-capacity powerplant. In April, various ethnic minority groups living along the Mekong River in Cambodia petitioned the Government of Laos to stop construction of the Xayaburi Dam because of concerns similar to those expressed by their Vietnamese counterparts. In May, the Government of Laos announced that it would suspend work on the Xayaburi Dam until a thorough review of the environmental impact assessment was completed (Bangkok Post, 2011; International Work Group for Indigenous Affairs, 2011; Khmernz.blogspot.com, 2011; Sophirom.wordpress.com, 2011; Voice of America, 2011).

As of 2011, Laos had 14 hydroelectric powerplants with a total production capacity of 2,540 MW and the potential to increase the country's capacity to a total of 26,000 MW. According to the Government, 17 hydroelectric powerplants were in various planning stages, and an additional 45 plants were under feasibility study (Lao Voices, 2011a, c).

In February, the Government of Laos approved the construction of the Xekaman 1 hydroelectric powerplant, which was planned to start construction in mid-2011. The project was projected to cost \$441 million and would be located in the southern Province of Attapeu in the Xekaman River (Xanxay district). The Xekaman 1 Power Co., which was a joint venture between Electricite du Laos (EDL) and Viet-Lao Power Joint Stock Co., signed a 30-year concession agreement with the Government of Laos. When commissioned in 2015, the plant would have an annual capacity to produce 1.22 billion kilowatt-hours of electricity, of which 80% would be exported to neighboring Vietnam and the remainder would be consumed locally. As part of its strategy to expand the country's power

generation potential, the Government signed two memorandums of understanding; one with Thailand to provide 7,000 MW of electrical generating capacity each year after 2015, and another with Vietnam to provide 3,000 MW of electrical generating capacity starting in 2011 until 2020 (Lao Voices, 2011a).

## Government Policies and Programs

The mining sector in Laos is governed by the Mining Law of 2008, which has been in the implementation stages since the law's adoption, and mining projects have been under a moratorium imposed by the Government since 2009. Since the moratorium went into effect, no new mining licenses have been issued. The moratorium was implemented as details emerged on licensed projects that had been inactive for an extended period of time and findings that mining operations were causing environmental damage and raising social concerns. The Government estimated that it would start granting new licenses between 2013 and 2014, once an effective monitoring system is implemented in the country (Lao Voices, 2011b; Mining Journal Online, 2011).

The Mining Law of 2008 establishes the requirements for obtaining a mining license to develop a mineral project. The Department of Mines issues the mining licenses. The Department of Geology and the Department of Mines jointly oversee the implementation of Laos's Mining Law, which includes inspecting and monitoring mineral development activities in the country; they also assist in the negotiation of mining contracts and in mineral exploration and mining licensing activities, promote investment in the mining sector, maintain geologic databases, and provide mineral exploration support and data analyses (Department of Geology and Mines of Laos PDR, 2010a, b).

## Structure of the Mineral Industry

As of mid-2011, a total of 152 mining companies were operating in Laos, of which 70 were locally owned and 82 were foreign enterprises (no information was available as to whether they were joint ventures or wholly foreign owned). Over the past few years, the Government has authorized mining companies to operate on 256 mining concessions across the country (Lao Voices, 2011b). Laos has a variety of undeveloped mineral resources, and the Government has recognized mining as a critical sector of the economy and continued to support the development of the sector by promoting domestic and foreign investment. In 2011, the significant producers of copper, gold, and silver in Laos were the Australian companies Minerals and Metals Group Lane Xang Minerals Ltd. (MMG LXML) and PanAust Ltd. The country's major mineral industry facilities are listed in table 2.

## Commodity Review

### Metals

**Bauxite and Alumina.**—The Laos Bolaven Plateau bauxite project, which is located in the southern part of the country, was being developed by Sino Australian Resources (Laos) Co., Ltd. (SARCO), which was a joint venture between China Nonferrous Metals Industry's Foreign Engineering and Construction Co., Ltd., of China (51%) (NFC) and ORD River Resources Ltd. of Australia (49%). SARCO had two tenements in the property for a total of 487 square kilometers (km<sup>2</sup>). They were the LSI tenement, which covered a 66-km<sup>2</sup> area, and the Yuqida tenement, which covered a 421-km<sup>2</sup> area. As of early 2011, the measured resource for the two tenements was estimated to be 69 million metric tons (Mt) at grades of 32% alumina and 2% silica content. In May, SARCO was in talks with investors to raise about \$200 million in equity and was finalizing plans for the construction of a 600,000-metric-ton-per-year (t/yr)-capacity alumina refinery in the country. In June, SARCO and NFC signed a memorandum of understanding for the construction of the alumina refinery, which had a total investment value of \$600 million. In October, ORD River Resources upgraded the Joint Ore Reserves Committee (JORC) resource estimate for the LSI tenement to 77 Mt of bauxite from the previous estimate of 19 Mt. The silica content of the ore remained at about 2.3%. The company was in the process of completing the necessary analysis to revise the estimation of the Yuqida tenement resource (ORD River Resources Ltd., 2011a, p. 1; 2011b, p. 1–2; 2011c, p. 9; 2012).

In April, Aluminum Corporation of China (Chinalco) announced that it had signed an agreement with a state-owned service firm in Laos to develop mineral resources in the country, although no additional details were released. Chinalco was diversifying its mining business to include other commodities, such as coal, copper, iron ore, and rare earths. The company's presence in Laos included a subsidiary of Chinalco—the Yunnan Copper Industry Group Co. Ltd. (YCI)—which was developing a copper project in the country (Thomson Reuters, 2011).

**Copper, Gold, and Silver.**—In March, Chinalco Yunnan Copper Resources Ltd. (CYU), formerly known as China Yunnan Copper Australia Ltd., signed an agreement to acquire a 51% interest in Yunnan Copper Sanmu Mining Ltd. (Sanmu Mining) from China at a cost of \$2.8 million. Sanmu Mining held 100% interest in four copper and silver projects in northern Laos within the Mohan development zone. The most advanced developments included the Jiuzhai project (which covered an area of 31 km<sup>2</sup> in Oudumaxai Province) and the Xinzhai project (which covered an area of 140 km<sup>2</sup> in Phongsali Province). Both projects were estimated to contain between 30 and 200 grams per metric ton (g/t) of silver and 1.3% copper. The other two projects were the Modeng and the Nadao deposits, which were in earlier stages of development. The company was planning to start mining operations in all the properties by 2013. In July, CYU announced that it had signed a joint-venture agreement with YCI to invest \$2 million in drilling and development projects in Laos (Australia's Paydirt, 2011; Chinalco Yunnan Copper Resources, undated).

In 2011, the Sepon copper-gold project produced a total of 78,859 t of copper cathodes and 2,317 kilograms (kg) of gold, which represented an increase of about 23% for copper and a decrease of about 29% for gold, respectively, compared with production in 2010. The increase in copper production was owing mainly to the new expansion in the Sepon copper plant that increased production to 80,000 metric tons per year (t/yr) from 65,000 t/yr. The expansion project was commissioned in December 2010. On the other hand, the decrease in gold production was caused by a combination of factors that included an intense tropical storm season, a decrease in ore availability in the Houay Yeng gold pit, and lower gold grades encountered. In late 2011, the oxide gold ore supply in Sepon was projected to be depleted by 2013. The Sepon project was operated by MMG LXML, which was a joint venture between Minmetals Resources Ltd (90%) and the Government (10%) (Minmetals Resources Ltd., 2011, p. 10, 12; MMG Ltd., undated).

PanAust, through its wholly owned subsidiary Pan Mekong Exploration Pty. Ltd., owned a 90% interest in the Lao-registered company Phu Bia Mining Ltd. (PBM) (which managed the Phu Kham copper-gold operation), and the Government owned the remaining 10%. The Government and PBM had a mineral exploration and production agreement that regulated exploration and mining within the company's contracted 2,636-km<sup>2</sup> area. In 2011, the Phu Kham copper-gold operation, which is located approximately 120 km north of the capital city of Vientiane, had produced 59,897 t of copper concentrate, which was a decrease of 11.7% compared with that of 2010 (table 1). The mine also produced 1,667 kg of gold, which was a decrease of about 8% compared with the 1,809 kg produced in 2010; and 16,738 kg of silver, which was an increase of 6% compared with the 15,788 kg of silver produced in 2010. The decrease in copper and gold production was mainly caused by extreme weather conditions during 2011. The Phu Kham upgrade project was underway and was expected to be completed by mid-2012. The upgrade, which had an estimated cost of \$95 million, was expected to increase the ore processing rate of the facility to 16 million metric tons per year (Mt/yr) from 12 Mt/yr (PanAust Ltd., 2011, p. 10, 14).

PanAust's interests in Laos also included the Ban Houayxai gold-silver project and the Phonsavan copper-gold project. During 2011, the Ban Houayxai project was under construction after the Government of Laos issued PanAust the permits to start construction in 2010. The Ban Houayxai project, which is located approximately 25 km west of the Phu Kham copper-gold operation, was expected to be commissioned by spring 2012 and to have a production capacity of more than 3,100 kilograms per year (kg/yr) of gold (reported as 100,000 troy ounces), and about 21,800 kg/yr of silver (reported as 700,000 troy ounces) when fully operational. The operation was estimated to have a mine life of 9 years (PanAust Ltd., 2011, p. 12).

The Phonsavan copper-gold project consisted of two copper deposits named KTL and Tharkhek, which are located within 5 km of each other. In 2011, drilling in the KTL deposit defined an estimated mineral resource of 89 Mt grading 0.44% copper and 0.18 g/t gold (PanAust Ltd., 2011, p. 14).

**Zinc.**—During 2011, Padaeng Industry Public Co. Ltd. of Thailand, through its wholly owned subsidiary

Padaeng Industry (Laos) Co. Ltd., continued its zinc exploration in a 400-km<sup>2</sup> area in Vientiane Province. The company focused on two prospects where zinc resources had been identified: the Pha Vang Sam and the Tham Noi Zinc. In December, the company estimated the mineral resources for the two prospects to be about 890,000 t at a grade of 9% zinc and 1.9% lead (Padaeng Industry Public Co. Ltd., 2011, p. 15).

### **Industrial Minerals**

**Cement.**—In March 2011, Lao Cement Co. Ltd. faced constant shortages of coal; therefore, it proposed to the Government that investors be allowed to prospect for coal to ease the shortage being faced by the cement industry. Otherwise, the cement factories would have to resort to importing coal, which would be expensive and could possibly result in increased cement prices. The company suggested that, to satisfy Laos's demand for cement, the country should produce at least 2 Mt/yr of cement; however, the combined annual production capacity from the six cement factories currently in operation in the country was only about 1.5 Mt/yr. Lao Cement planned to build a third cement plant in Vang Vieng with the capacity to produce from 0.7 to 1 Mt of cement; the plant was expected to be commissioned by 2013. Another cement factory was also under construction in the Province of Saravane; this facility was expected to be commissioned later in the year, with a capacity to produce 0.5 Mt/yr of cement (Cemnet.com, 2011).

**Potash.**—In October 2011, the China-ASEAN Fund (CAF) on investment cooperation announced that it had invested \$50 million for the development of a potash ore mine in Laos. The investment was for the acquisition of a stake in Asian Potash Corp. Ltd., which was an investor in the Laos potash ore mine located in Khammouane Province. The first phase of the mine, which would have the capacity to produce an estimated 500,000 t/yr of potash, was expected to be commissioned during the first quarter of 2012. When completed, the mine (which was valued of \$1.25 billion) was expected to have a total annual production capacity of 3 Mt of potash (ChinaDaily.com, 2011).

### **Outlook**

As Laos continues to develop its infrastructure and create business ties with neighboring countries, its demand for construction materials, fertilizers, metals, and fuel minerals is expected to increase to meet local demand and the growing demand from regional and global markets. Laos, with its high potential for hydroelectric power and mining that has attracted Chinese investors to the country, was mostly interested in investing in infrastructure projects, such as a high-speed rail to link the Chinese border to Vientiane, and to collaborate in the construction of dams to produce hydroelectric power (Lao Voices, 2011c). During 2011, and following the trend of recent years, Laos increased its partnerships with Asian countries, such as China, for the exploration of bauxite, copper, and potash; Laos also partnered with Thailand in the operation of the biggest hydroelectric dam in the country and the development of the zinc industry. Laos's participation in such projects enhances its

economic development and economic cooperation with other southeast Asian countries.

In 2012, copper cathode production at the Sepon project is expected to reach full capacity of 80,000 t/yr when the expansion commissioned at the end of 2010 is completed. Gold production in Sepon is expected to stay at about 3,500 kg/yr for 2012. Production of copper concentrates in the Phu Kham project is expected to remain at 70,000 t/yr during 2012. PanAust expects its gold and silver production to increase in 2012 following the commissioning of the Ban Houayxai project. Increases in the production of potash are also expected within the next few years as mines and plants that were in construction during 2010 and 2011 are completed.

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TABLE 1  
LAOS: ESTIMATED PRODUCTION OF MINERAL COMMODITIES<sup>1,2</sup>

(Metric tons unless otherwise specified)

Commodity <sup>3</sup>	2007	2008	2009	2010	2011	
Barite	29,000	29,000	29,000	17,500 <sup>r,4</sup>	12,400 <sup>4</sup>	
Cement	400,000	400,000	400,000	400,000	400,000	
Clay	5,500	5,500	5,500	5,500	5,500	
Coal, lignite	620,000	600,000	600,000	501,600 <sup>r,4</sup>	511,700 <sup>4</sup>	
Copper:						
Concentrate	--	24,929 <sup>4</sup>	54,019 <sup>4</sup>	67,806 <sup>4</sup>	59,897 <sup>4</sup>	
Metal, refined <sup>4</sup>	62,541	64,075	67,561	64,241	78,859	
Gemstones, sapphire	carats	1,200,000	1,200,000	1,200,000	1,200,000	
Gold <sup>4</sup>	kilograms	5,137	4,333	5,033	5,061	3,984
Gravel		120,000	120,000	120,000	120,000	120,000
Gypsum		775,000	775,000	775,000	553,300 <sup>r,4</sup>	686,100 <sup>4</sup>
Lead, mine output		NA	NA	NA	2,710 <sup>4</sup>	2,721 <sup>4</sup>
Limestone		750,000	750,000	750,000	750,000	750,000
Salt, rock		35,000	35,000	35,000	32,200 <sup>r,4</sup>	35,100 <sup>4</sup>
Sand, construction materials		100,000	100,000	100,000	100,000	100,000
Silicon, metal <sup>4</sup>		--	3,026	7,350	7,768	3,001
Silver <sup>4</sup>	kilograms	4,500	6,700	14,726	15,788	16,738
Tin, mine output, Sn content <sup>5</sup>		370	450	240	410 <sup>r,4</sup>	750 <sup>4</sup>
Zinc, mine output, Zn content		3,000	2,200	3,400	5,000 <sup>r,4</sup>	4,320 <sup>4</sup>

<sup>r</sup>Revised. NA Not available. -- Zero.

<sup>1</sup>Estimated data are rounded to no more than three significant digits.

<sup>2</sup>Table includes data available through January 10, 2013.

<sup>3</sup>In addition to the commodities listed, crude construction materials, such as sand and gravel, and varieties of stone were produced irregularly.

<sup>4</sup>Reported figure.

<sup>5</sup>Estimated figures based on Laos inferred exports of tin ores to China, Thailand, and Vietnam.

Sources: U.S. Geological Survey Minerals Questionnaire for Laos (2007); Oxiana Ltd. Annual Reports 2007–08 and Quarterly Reports 2007; Pan Australian Resources Ltd., Annual Report 2009–11 and Quarterly Reports 2007; Minerals and Metals Group Lane Xang Minerals Ltd. (MMG LXML) Quarterly Reports 2009–11; World Metal Statistics, December 2010.

TABLE 2  
LAOS: STRUCTURE OF THE MINERAL INDUSTRY IN 2011

(Metric tons unless otherwise specified)

Commodity		Major operating companies and major equity owners	Location of main facilities	Annual capacity <sup>e</sup>
Barite		Barite Mining Co., Inthavong Mining Co., Lao Development Construction Co., Phethongkham Co., Oravan Barite Co., and Singphooufar Co.	Muongfuong and Sanakham, Vientiane Province	30,000 <sup>1</sup>
Cement		Lao Cement Co. Ltd., a joint venture between China Yunnan Corp. for International Techno-Economic Cooperation and Lao State Agricultural Industry Development Enterprise Imp-Exp & General Service	Vangvieng Cement Plant No. II	250,000
Do.		Wanrong Cement I	Vangvieng, Vientiane Province	78,000
Do.		Wanrong Cement II (Yuannan Industrial Economic Co., 60%, and Agricultural and Forestry Development and Service Co. of Laos, 40%)	do.	200,000
Do.		Wanrong Cement III	Savannakhet Province	200,000
Coal:				
Anthracite		Agriculture Industry Development Enterprises	do.	60,000
Lignite		Viengphoukha Coal Mine Co. Ltd.	Viengphoukha, Luangnamtha Province	300,000
Copper:				
Mined ore output, Cu content		Minerals and Metals Group Lane Xang Minerals Ltd. (MMG LXML), 90%, and Government, 10%	Sepon, Vilabouly District, Savannakhet Province	80,000
Refined		do.	do.	80,000
Do.		Phu Bia Mining Ltd. (wholly owned subsidiary of PanAust Ltd.), 90%, and Government, 10%	Phu Kham copper-gold operation located in Xaisomboun special zone, 120 kilometers north of Vientiane, Vientiane Province	65,000
Gemstone, sapphire	carats	Bokeo Mining Co. Ltd.	Bokeo Province	300,000
Do.	do.	Buhae Industrial Corp.	Houaxay District, Bokeo Province	500,000
Do.	do.	Lao International Trade and Service	do.	400,000
Gold, mine output, Au content	kilograms	Minerals and Metals Group Lane Xang Minerals Ltd. (MMG LXML), 90%, and Government, 10%	Sepon, Vilabouly District, Savannakhet Province	7,500
Do.	do.	Phu Bia Mining Ltd. (wholly owned subsidiary of PanAust Ltd.), 90%, and Government, 10%	Phu Kham copper-gold operation located in Xaisomboun special zone, 120 kilometers north of Vientiane, Vientiane Province	1,700
Gypsum		Lao State Gypsum Mining Co. Ltd.	Champhon District, Savannakhet Province	200,000
Do.		Mining Development Economy Cooperation (OEDCD)	Tha Kect District, Khammouane Province	150,000
Do.		Savan Gypsum Mining Co. Ltd.	Champhon District, Savannakhet Province	70,000
Do.		LAVICO Co. Ltd. (a Laos-Vietnam joint venture)	Xebangfay District, Khammouane Province	100,000
Limestone		Laos Cement Co. Ltd. (a Laos-China joint venture)	Vangvieng, Vientiane Province	250,000
Do.		Agriculture Industry Development Enterprises	do.	150,000
Do.		V.S.K. Co. Ltd.	Tha Kect District, Khammouane Province	150,000
Do.		Phanangnon Co. Ltd.	do.	100,000
Potash		SinoAgri Mineral Resources Exploration Ltd. (a joint venture between Beijing Jiang Zhi Yuan Investment Ltd. and China National Agricultural Means of Production Group Corp.)	Plant in Sakhon Nakon Basin in the Khammouane Province	100,000
Do.		Laotian Potash Mining Industry Ltd. Co.	Potassium chloride plant	50,000
Silver	kilograms	Phu Bia Mining Ltd. (wholly owned subsidiary of PanAust Ltd.), 90%, and Government, 10%	Phu Kham copper-gold operation located in Xaisomboun special zone, 120 kilometers north of Vientiane, Vientiane Province	14,000
Tin, mine output, Sn content		Lao-North Korea Tin Mines	Hinboune District, Khammouane Province	120
Do.		S V Mining Co. Ltd.	do.	300

See footnotes at end of table.

TABLE 2—Continued  
 LAOS: STRUCTURE OF THE MINERAL INDUSTRY IN 2011

(Metric tons unless otherwise specified)

Commodity	Major operating companies and major equity owners	Location of main facilities	Annual capacity <sup>e</sup>
Zinc, mine output, Zn content	Padaeng Industry Public (Laos) Co. Ltd. [Majority interest owned by Padaeng Industry (Public) Co. Ltd., and minority interest owned by the Government]	Kaiso, Vangvieng, Vientiane Province	5,000

<sup>e</sup>Estimated. Do., do. Ditto.

<sup>1</sup>Estimated combined capacity of the six local barite mining companies.