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SECTOR PLAN FOR SUSTAINABLE DEVELOPMENT OF THE MINING SECTOR IN THE LAO PDR

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Abbreviations and Acronyms

BGS	British Geological Survey
BRICs	Brazil, Russia, India and China
CIL	Carbon in Leaching
CIP	Carbon in Pulp
DFR	Draft Final Report
DGM	Department of Geology and Mines of Lao PDR
DGMV	Department of Geology and Minerals of Vietnam
DMR	Department of Geology and Mineral Resources of Thailand
ESCAP	Economic and Social Commission for Asia and the Pacific
FS	Feasibility Study
GIS	Geographic Information System
IPR	Interim Progress Report
IRR	Internal Rate Return
LIBOR	London Interbank Offered Rate
LME	London Metal Exchange
MVT	Mississippi Valley Type Deposit
NPV	Net Present Value
T/C	Treatment Charge
R/C	Refinery Charge
SXEW	Solvent Extraction and Electrowinning
UN	United Nations
UNID	United Nations Industrial Development Organization
USGS	United States Geological Survey

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1. Overview of Mineral Resources

The main objectives of economic geology based on the Terms of Reference (July 2005) are as follows:

- Assess the current state in terms of quality, quantity, and coverage of geological mapping and geo science databases on mineral resources and potential zones.
- Prepare an inventory of mineral deposits on the basis of tonnage, grade and exploration possibilities.
- Prepare for the consideration of the Bank, low-medium-high growth scenarios based on the economic viability of the deposits using reasonable capital and operating costs, as well as market, financial and other conditions

The mining industry in Lao PDR, has so far produced coal, copper, gold, zinc, gypsum, barite, clay, industrial stones, and sapphire etc. However, since the latter half of the 1990's, foreign investment explorations focusing on gold and copper have been implemented, and results include the Sepon gold mine in Savannakhet Province in southern Laos. So far, gold and copper have given the Laotian economy its greatest forward push.

According to the 2004 Mineral Yearbook published by DGM, mineral production in Laos in 2004 amounted to 6.7 t of gold, 137 t of tin, 2,000 t of zinc, 298,000 t of coal, 10,000 t of barite, 244,000 t of gypsum, and 712,000 carats of sapphire, as well as clay, limestone, and granodiorite (Table1).

Table 1 Recent Trends in Mineral Production in Laos

Commodity		unit	1997	1998	1999	2000	2001	2002	2003	2004
Metal	Gold	T	–	–	–	–	–	–	9.7	6.8
	Tin	T	1,030	895	765	800	816	610	593	137
	Zinc	T	–	–	–	–	28,745	1,345	3,069	2,000
Industrial material	Barite	T	3,000	9,050	5,045	3,500	4,400	12,965	18,070	10,470
	Clay	T	66,343	55,088	51,267	39,808	54,324	117,572	37,220	58,718
	Gypsum	T	144,306	130,250	151,000	142,197	121,220	119,514	101,727	244,145
	Limestone	m3	597,961	127,227	106,700	169,911	173,769	483,507	139,341	190,440
	Phosphorite	T	–	–	–	–	–	–	600	–
	Salt	T	3,723	3,745	3,194	3,637	2,635	5,410	16,130	–
Construction material	Basalt	T	114,137	8,887	–	–	–	–	6,210	–
	Granite	m3	–	97,084	–	–	–	205	–	–
	Granodiorite	m3	5,860	5,000	8,150	15,206	6,292	1,425	25,445	3,340
	Gravel	m3	286,000	287,000	73,800	60,369	132,469	223,616	219,708	39,563
	Sand	m3	755,092	865,716	91,520	92,860	105,847	309,619	229,176	161,981
	Sandstone	m3	–	–	–	–	–	11,870	–	–
Fuel	Coal	T	108,022	86,081	538,816	184,169	122,942	233,823	212,819	298,761
Gemstone	Gemstone	Cts	211,511	2,553,460	6,599,940	189,284	–	–	2,302,974	712,320
		(kg)	(42.3)	(510.7)	(1320.0)	(37.9)	(–)	(–)	(460.6)	(142.5)

Source:DGM,Mineral Year Book 2004

Gold in Laos has been produced by small-scale artisanal gold mining, which is not reflected in the official records. However, the Sepon gold mine started to operate in December 2002, and the mine produced 26.5 t of gold by December 2005. The Phu Bia gold mine started to operate in November 2005 and it had produced 0.18 t of gold by the end of December 2005.

The Sepon mine started to exploit copper ore in December 2004 and it produced 30,000 t of electric copper in 2005. The Sepon mine has a planned annual production of 60,000 t of electric copper for 2006. The Phu Kham copper project announced in April 2006 that the project had been

determined feasible as the result of a bankable feasibility study. This project will start with an annual production of 50,000 t of copper, 100,000 ounces of gold, and 400,000 ounces of silver. Thus, the mining industry in Laos has become active with the development of large-scale gold and copper mining.

2. Present Status of Geo-information

2.1 Geological Map

DGM has two kinds of geological maps that cover all the territory of Laos. One is a geological map at 1:1,500,000 scale made by UN/ESCAP in 1990, and the other is a geological and mineral resources map at 1:1,000,000 scale made by BGS in 1990-91. An explanatory brochure is attached to the UN/ESCAP geological map. The brochure summarizes stratigraphy and geological structure, mineral deposits and metallogeny, and lists 250 mineral deposits and prospects.

Digitization of the 1:1,000,000 geological and mineral resource maps have begun, and the 250 mineral deposits and prospects of UN/ESCAP were digitized in 2003. A digital index map of concession areas was drawn in 2004, and is revised as the occasion demands (Table 2).

Table 2 Geological and Mineral Resource Maps in DGM

	Scale	Type of map	Date published	Organization	Digital/analog	Language	Remarks
1	1/1,500,000	Geological map	1990	UN/ESCAP	analog	English	250 mineral deposits and occurrences
2	1/1,000,000	Geological and mineral resource map	1990-1991	BGS	digital	English	Mineral exploration and development plan
3	1/2,500,000	Mineral resources map	2003	DGM	digital	English	Compiled from UN/ESCAP maps,1990
4	1/2,500,000	Mineral potential map	2003	DGM	digital	English	Compiled from BGS maps, 1990-91
5	1/1,000,000	Map of concession area	2006	DGM	digital	English	121 licenses as of January 2006
6	1/1,200,000	Mineral resources map	2002	DGM	digital	English	-
7	1/1,000,000	Distribution of limestone	1997	DGM	digital	English	-
8	1/1,000,000	Distribution of granite and basalt	1998	DGM	digital	English	-
9	1/1,000,000	Location of portland cement, trap rock, marble quarries	1997	DGM	digital	English	-
10	1/200,000	Geological map	1985 - 2005	DGM/DGMV	digital	Vietnamese, English	coverage for 30% of Laos
11		Mine location map		DGM	digital	English	-

Geological map coverage for the central area (30%, 12 maps) of Laos has been completed at 1:200,000 with the support of the Department of Geology and Minerals of Vietnam (DGMV). Moreover, DGMV has continued a geological survey at 1:200,000 in the northern and southern areas of Laos. Twelve maps of the northern area will be completed by 2006, and 9 maps of the southern area will be finished by 2008. Geological map coverage for 80% of Laos will be completed at 1:200,000. DGM has also requested cooperative research with the Department of Mineral Resources of Thailand for 3 map-areas in the western part of Laos.

The present service situation of the 1:200,000 geological maps is represented in Fig.1 and Appendix 1. There are several issues with the usage of these maps, because some of the explanations attached to the geological maps are written in Vietnamese, not English, and only the staff understands them.

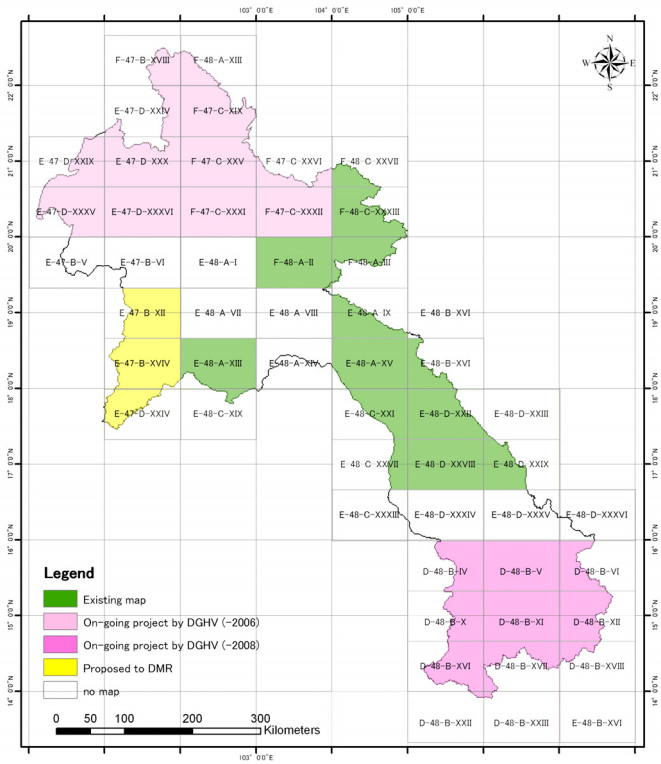


Fig.1 Present Service Condition of 1:200,000 Geological Maps

- Geological maps and mineral resource maps were made in 1990 and 1991, and have not been updated since then.
- Digitization of the geological maps has been done, but the geo-information is out of date because it is based on 1990's geological and mineral resource maps.
- Geological map coverage for 80 % of the territory of Laos will be completed at 1:200,000 by 2008 with the support of the Vietnamese Government.
- Some explanations attached to geological maps are written in Vietnamese, so they are of limited use.
- In the reports of the geologic maps made by Vietnam, individual deposits area described, but there is neither genesis of these deposits nor presentation of deposit models.
- Regarding copper, tin, antimony and tungsten deposits, there are no lists of analytical values of ores and location maps. Because it is not possible to cross-check them, the accuracy of the deposit description is uncertain.
- Thus, the reader doesn't understand this information easily, because there are no prospecting guidelines according to the deposit type, and no description of metallogenic province.
- There is a general description of promising regions. However, no specific prospecting target districts are pointed out, and there is no information about prospecting methods or amount of the survey. Therefore, these reports are of little interest to investors.

2.2. Cooperative Research

DGM has successfully carried out cooperative geological surveys and mineral deposit research with international organizations and overseas institutes. Since 1996, the six projects listed in Table 3 have been implemented. DGM has executed geological mapping at 1:200,000 and mineral occurrence research with DGMV. It has carried out reconnaissance of bauxite, and exploration for potash and gypsum deposits. DGM has also worked out countermeasures against mercury pollution at artisanal gold mines with UNID.

Thus, fundamental research in geology and mineral deposits has been implemented with the governmental geological institutes of neighboring countries, such as Vietnam and Thailand, and with international organizations.

- DGM cannot execute geological surveys and mineral occurrence research independently, because of financial difficulties, and the poor condition or lack of equipment.
- DGM has implemented geological mapping and mineral resources research with the governmental geological institutes of neighboring countries

Through research with the support of neighboring country governments, those countries are able to utilize the resulting mineral resource information. This requires that methods be derived to arrange, utilize, and to manage mineral information.

Table 3 Surveys and Research Projects in the Past 10 Years (1995-2005)

Field	Name of survey/research	Period	Cooperator	Content	Result
Geological survey	Bauxite and other mineral reconnaissance in the Southern part of Laos	2005 - 2008	DGMV	To research bauxite resources in the four southern provinces of Champasak, Attapu, Salavan and Xekong	On-going
Environmental	Removal of Barriers to the Introduction of Cleaner Artisanal Gold Mining and Extraction technologies	2003 - 2006	UNID	Countermeasures against mercury pollution	On-going
Exploration	Exploration of potash and gypsum deposits in Savannakhet and Khammouan provinces	2002 - 2004	DGMV	1/200,000 400km2 1/10,000 10km2 trenching 98km3 drilling 4100m geophysics 120km geochemical sampling 770	Completed
Geological mapping	Geological mapping and Mineral Occurrences on scale of 1/200,000 in the Northern part of Laos	2001 - 2006	DGMV	Geological mapping 14,000km2	On-going
Geological mapping	Geological mapping and Mineral Occurrences on scale of 1/200,000 in the Mid-Central part of Laos	1996 - 2000	DGMV	Geological mapping	Completed
Prospect	Aerophoto interpretation	Request	Thailand DMR	West part of Laos	

DGMV: Department of Geology and Minerals of Vietnam
DMR: Deapartment of Mineral Resources of Thailand

3. Inventory of Mineral Deposits

The inventory of mineral deposits and prospects in Laos is based on 337 deposits which have been rendered in GIS format by BGS (1991), and includes 250 mineral deposits and prospects of gold, tin, tungsten, base metals (copper, lead, and zinc), sapphire, and gypsum, which have been listed by UN/ESCAP (1990), not including duplicate deposits and prospects (Appendix 2), and the 97 metallic, non-metallic and coal deposits registered by DGM, which are listed in Appendix 3. In this report the final total number is 572 deposits and prospects (Fig. 2), because the deposits and prospects of non-metallic minerals and coal were added to the IPR.

The breakdown is as follows: gold – 150 (26%); copper – 45 (8%); zinc and lead – 75 (13%); Tin – 37 (7%); iron – 52 (9 %); other metals – 46 (8%); gypsum – 9 (2%); limestone – 20 (4%); rock salt – 46 (8%); other industrial materials – 34 (6%); coal – 52 (9%); gemstone – 6 (1%).

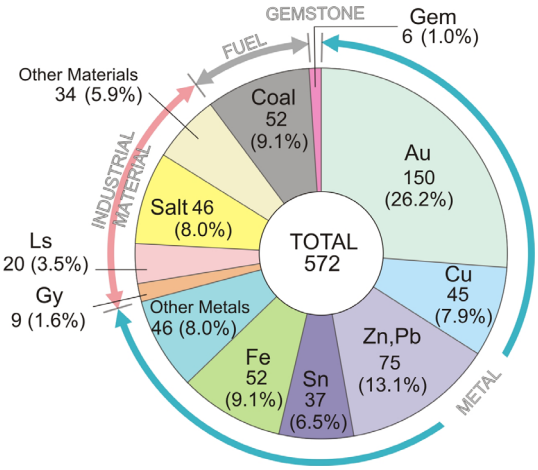


Fig. 2 Classification of Deposits and Prospects

Table 4 Reserves and Resources of Mineral Commodities in Laos

Mineral Commodity	Ore Reserves & Resources (million t)			Au Reserves & Resources (kg)		
	Reserves	Resources	Total	Reserves	Resources	Total
Gold	32	38	70	72,049	107,028	179,077
Placer gold	12	-	12	7,038	123	7,161

Including gold metal of reserves (36t) and resources (46t) at the Phu Khan copper deposit

Mineral Commodity	Ore Reserves & Resources (million t)			Metallic Reserves & Resources ('000 t)		
	Reserves	Resources	Total	Reserves	Resources	Total
Copper	162	293	455	1,676	3,297	4,973
Zinc	0.09	-	0.09	13	-	13
Tin	38	7	45	20	21	41
Iron ore	26	40	66			
Gypsum	8	80	88			
Clay	5	70	75			
Glass sand	4	4	8			
Rock salt (potash)	-	50,699	50,699			
Rock salt (halite)	-	395	395			
Limestone	14	2,199	2,213			
Barite	0.01	0.06	0.07			
Phosphorite	0.01	0.03	0.04			
Coal	516	101	617			
Gemstone, sapphire ('000 carats)	-	23,263	23,263			

Mineral deposits registered by DGM are listed in the brochure "Mineral Reserves of Lao PDR". Based on this list, major mineral deposits are compiled in addition to exploration reports, feasibility study reports of various companies, and data from several documents and drawings obtained by interviews with mining companies. The inventory of those registered deposits is listed in Appendix 3, and the locations of those deposits are shown in Fig. 3. Reserves and mineral resources in Laos are summarized in Table 4. Inventories of major mineral deposits are summarized in Table 5.

Table 5 Summary of Inventories of Major Mineral Deposits

Mineral type	No.	Name of deposit	Province	Scale	Au Reserves & resources (Kg)			Grade	Characteristic
					Reserves	Resources	Total		
1. Gold (Au)	1.1	Sepon	P. Savannakhet	Large	48,788	105,879	154,667	Au 3.06g/t	Carline type
	1.2	Phu Bia	P. Vientiane	Middle	16,944		16,944	Au 1.0 g/t	Oxide gold cap mineralization
	1.3	Sakay	P. Vientiane	Small	4,208		4,208	Au 9-22 g/t	Quartz vein
	1.4	Pounlak	P. Vientiane	Small		1,149	1,149	Au 0.85 g/t	Skarn
	1.5	Phapon	P. Louanprabang	Small	2,109		2,109	Au 2.4 g/t	Quartz vein
Total					72,049	107,028	179,077		
2. Placer Gold (Au)	2.1	Nakadok	P. Bolikhamxay	Small		123	123	Au 2-7 g/m^3	Alluvial gold
	2.2	Nam Ke - Nam Pheo	P. Bolikhamxay	Small	161		161	Au 0.5 g/m^3	Alluvial gold
	2.3	Ban Pak Sum	P. Bolikhamxay	Small	6,828		6,828	Au 0.5-0.8 g/t	Alluvial gold
	2.4	Houel Khing	P. Vientiane	Small	49		49	Au 0.2-0.6 g/m^3	Alluvial gold
Total					7,038	123	7,161		

Mineral type	No.	Name of deposit	Province	Scale	Ore reserves & resources ('000 t)			Grade	Characteristic
					Reserves	Resources	Total		
3. Copper (Cu)	3.1	Sepon	P. Savannakhet	Large	15,500	95,310	110,810	Cu 2.5%	Skarn, porphyry copper
	3.2	Phu Kham	P. Vientiane	Large	144,000	192,000	336,000	Cu 0.60%	Porphyry copper
	3.3	Ban Houei Mo	P. Louangnamtha	Small	2,099	5,507	7,606	Cu 2.24%	Quartz sulfide vein
	3.4	Phu Taxan (Phuda)	P. Phongsaly	Small	41		41	Cu 15%	Fracture zone
Total					161,640	292,817	454,457		
4. Zinc (Zn)	4.1	Kaiso	P. Vientiane	Small	23		23	Zn 37%	Epigenetic deposit after skarn
	4.2	Puda	P. Phongsali	Small	63		63	Zn 7%, Pb 12%	Fracture zone
	4.3	Pha Luang	P. Vientiane					Pb+Zn 8-26%	Mississippi Valley type
Total					86		86		
5. Tin (Sn)	5.1	Phon Tiou	P. Khammouan	Middle	5,689	4,400	10,089	Sn 0.24%	Quartz vein, stockwork
	5.2	Bo Neng (Phou Khoune)	P. Khammouan	Middle	2,389	2,729	5,118	Sn 0.23%	Quartz vein, stockwork
	5.3	Nong Xun	P. Khammouan	Small	28,968		28,968	Sn 171g/m^3	Alluvial deposit
					542		542	Sn 0.144%	Alluvial deposit
Total					37,588	7,129	44,717		
6. Iron (Fe)	6.1	Phou Nhouan	P. Xiengkhouang	Middle	26,166		26,166	Fe 25-69%	Skarn
	6.2	Pha Lek	P. Houaphan	Small		30,000	30,000	non	Skarn
	6.3	Ban Mone	P. Xiengkhuang	Small		1,500	1,500	Fe 29-66%	Skarn
	6.4	Ban Boneng	P. Khammouan	Small		5,000	5,000	non	Hydrothermal
	6.5	Hinheup-Kasi	P. Vientiane	Small		3,012	3,012	Fe 55%	
Total					26,166	39,512	65,678		
7. Gypsum ($CaSO_4 2H_2O$)	7.1	Khok Hin Keo	P. Savannakhet	Large	5,466	10,555	16,021	$CaSO_4 2H_2O$ 92-98%	Evaporite
	7.2	Bounghouana - Tung	P. Khammmouan	Large	2,354	14,217	16,571	$CaSO_4 2H_2O$ 93%	Evaporite
	7.3	Vientiane Plain	P. Vientiane	Large		13,000	13,000	$CaSO_4 2H_2O$ 95-99%	Evaporite
	7.4	Ban Laomakkha	P. Savannakhet	Large		42,120	42,120	CaO 32-34%	Evaporite
Total					7,820	79,892	87,712		
8. Potash-Halite (KCl - NaCl)	8.1	Thagone	P. Vientiane	Large	potash	50,344 million	50,344 million	KCl 15-19%, Av 15%	Evaporite
	8.2	Nonglom	P. Khammouan	Large	potash	139 million	139 million	KCl 19%, $MgCl_2$ 16%	Evaporite
					soda	195 million	195 million	NaCl 52%	
	8.3	Nahe	P. Khmmouan	Large	potash	26 million	26 million	KCl 17.5%, $MgCl_2$ 13%	Evaporite
					soda	200 million	200 million		
Total					potash	50,699 million	50,699 million		
					soda	395 million	395 million		
9. Coal	9.1	Hongsa lignite deposit	P. Sayaburi	Large	511,025		511,025		Sedimentary
	9.2	Muong Phane	P. Xiengkhouang	Middle	591	9,738	10,329		Sedimentary
	9.3	Viengphoukha	P. Luangnamtha	Middle		10,974	10,974		Sedimentary
	9.4	Chakeui	P. Saravan	Middle		27,987	27,987		Sedimentary
	9.5	Phongsaly	P. Phongsaly	Middle		24,500	24,500		Sedimentary
	9.6	Nam Geun	P. Oudomxay	Middle		12,727	12,727		Sedimentary
		Other 9 deposits		Small	4,125	15,112	19,237		Sedimentary
Total					515,741	101,038	616,779		
10. Sapphire ('000 carats)	10	Houei Say	P. Bokeo	Middle		18,422	18,422		Volcanic
	10	B. Houei Say	P. Bokeo	Middle		4,840	4,840		Volcanic
Total						23,262	23,262		

The exploration reports and FS reports submitted to DGM are checked by the Mining

Concession & Management Division. Geological descriptions in the reports, technical investigations and calculation of ore reserves are examined by the Geological Division. A lot of geologists of the Geological Division have knowledge of geology and mineral deposits which is required of government geologists, but their knowledge of ore reserve calculations is insufficient. For instance, numeric values of ore reserves have been overestimated in reports by Chinese mining companies, though it was a little data. The ability to point out in accuracies in ore reserve calculations is needed at DGM. It will be necessary to construct a checking system in DGM and to be instructed by specialist from foreign countries.

Based on previous data, reserves of gold ore amount to 32 million t, and resources amount to 38 million t. Gold reserves amount to 72 t, and gold resources come to 107 t. Five gold deposits are registered. Within these gold deposits, the Discovery and other Sepon mine gold deposits account for 48.8 t of gold (68 % of total gold reserves), and the Phu Bia gold deposit accounts for 16.5 t (24%), thus the combined total of the two mines accounts for 92% of total gold reserves. As to other registered deposits, there are the Sakay gold deposit (4 t of gold reserves), Poulak gold prospect (1 t of gold resources) in Vientiane province, and the Phapon gold deposit (2 t of gold reserves) in Louan Prabang province.

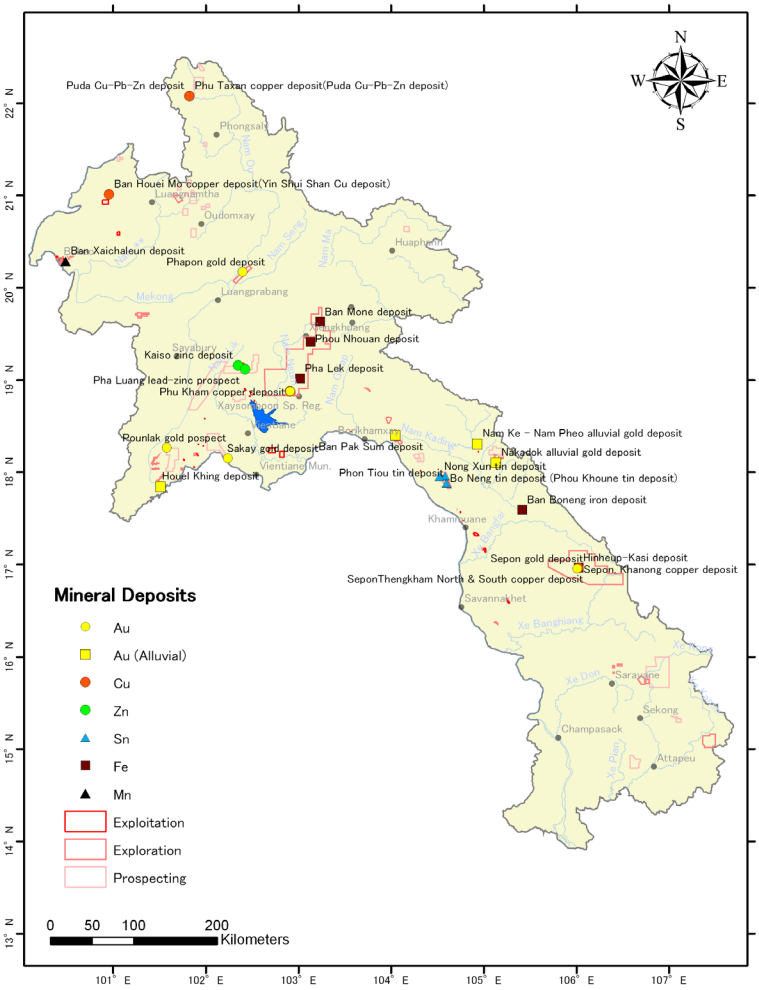


Fig. 3 Location of Major Mineral Deposits

Placer gold amounts to 7 t of reserves, but there is no specific tonnage of gold resources reported by DGM. Four placer gold deposits are registered, and the Ban Pak Sum placer gold deposit in Bolikhamxay Province contains 6.8 t of gold reserves. Also, the Nakadok (123 kg of gold resources) and the Nam Ke-Nam Pheo (161 of gold reserves) gold placer deposits exist in Bolikhamxay province, and the Houel Khing gold place deposit (49 kg of gold reserves) in Vientiane province.

Copper ore amounts to 162 million t of reserves and 293 million t of resources, and there are 1,676 thousand t of reserves and 3,297 thousand t of resources of copper metal. Four copper deposits are registered for a total of 162 million t of reserves ore. The Khanong copper deposit in the Sepon mine accounts for 15.5 million t of reserves ore (grade: 5.2 % Cu), and the Phu Kham copper deposit amounts to 144 million t of reserves ore (0.56 % Cu). These two deposits combined account for 98 % of the total reserves of ore. Within the 293 million t of copper ore resources, the Phu Kham copper deposit accounts for 192 million t (0.62 % Cu), and the Khanong, Thengkham North, and Thengkham South deposits in the Sepon mine account for 95 million t (2.08 % Cu). Another small-scale deposit, the Ban Houei Mo copper deposit in Louang Nam Tha province, accounts for 7 million t (2.24 % Cu) of reserves and resources of copper ore.

There are no large or medium-size zinc deposits; total zinc metal reserves barely account for 12,700 t.

Three tin deposits are registered in Khammouan province, and they account for 38 million t of tin ore reserves and 7 million t of tin ore resources. Both the Phon Tiou and the Bo Neng tin deposits are relatively medium-scale deposits. The Phon Tiou tin deposit has 5.7 million t (0.19 % Sn) of tin ore reserves and 4.4 million t (0.32 % Sn) of resources. The Bo Neng tin deposit has 2.4 million t (0.22 % Sn) of tin ore reserves and 2.7 million t (0.23 % Sn) of resources.

There are no criteria for reserves and resources at DGM. For example, DGM uses standards for ore reserve calculations from both the West (Australia) and the former Soviet Union, according to an interview with the person in charge of the Geological Division. DGM registers numeric values that are recorded in the exploration reports and FS reports of the mining license holder. Australian exploration and mining companies have reported ore reserve calculations based on Australian standards, but Chinese companies have reported them according to Chinese calculation standards. Thus, the accuracy of the values reported to DGM is inconsistent. In some reports by Chinese companies, ore reserves have been calculated based on limited drilling and tunneling exploration, and there might be overestimation of ore reserves.

DGM needs to establish a standard for ore reserve calculation based on the UN International Framework Classification for Reserves/Resources, JORC code (Australian Code for Exploration Results, Mineral Resources and Ore Reserves) and National Instrument 43-101 (NI43-101) which is a set of rules developed by the Canadian Securities Administrators. Also needed are a governmental organization and a system by which ore reserves, resources and potential can be calculated. A standard for the ore reserve calculation is proposed in the action plan (separate volume).

Moreover, for industrial materials, construction materials, coal, and gemstones, mineral reserves and resources have been registered based on reports from mining license holders. DGM

needs to have an evaluation standard, and better knowledge, skills for evaluating reserves.

Among the data on 572 deposits and prospects, for deposits that have been by an enterprise, the amount of ore reserves and grade of each ore body are displayed in a table. However, in other exploration reports, the exact locations of the analyzed data of the ore deposits are not given. Because it is not known whether the representative value of each analytical data set is a mean value or not, and because the analysis number is uncertain, it seems that the accuracy of the analysis data is low. Because there is little microscopic observation data on ores, the accuracy of the evaluations of the deposits and prospects is also probably low.

4. Potential of Mineral Resources

Regarding the 572 mineral deposits and prospects in Laos, the locations of gold, copper, zinc, and tin, which are particularly important for the Laotian economy, are plotted on each map, taking account of geological features, mineralization and mineral deposit types. Mineral potential zones have also been identified on the maps.

4.1 Gold Potential Areas

From a geological structural point of view (see upper right part of Fig. 4) , Laos consists of four units: the Sukhothai fold belt (mainly composed of Middle to Upper Paleozoic system and granitic rocks of the Late Paleozoic era), the Loei fold belt (mainly composed of Middle to Upper Paleozoic system, Lower Mesozoic system and granitic rocks of the Late Paleozoic era), the Indochinese fold belt (mainly composed of Middle to Upper Paleozoic system and granitic rocks of the Late Paleozoic era) and the Khorat plateau (mainly Mesozoic group to Paleogene system).

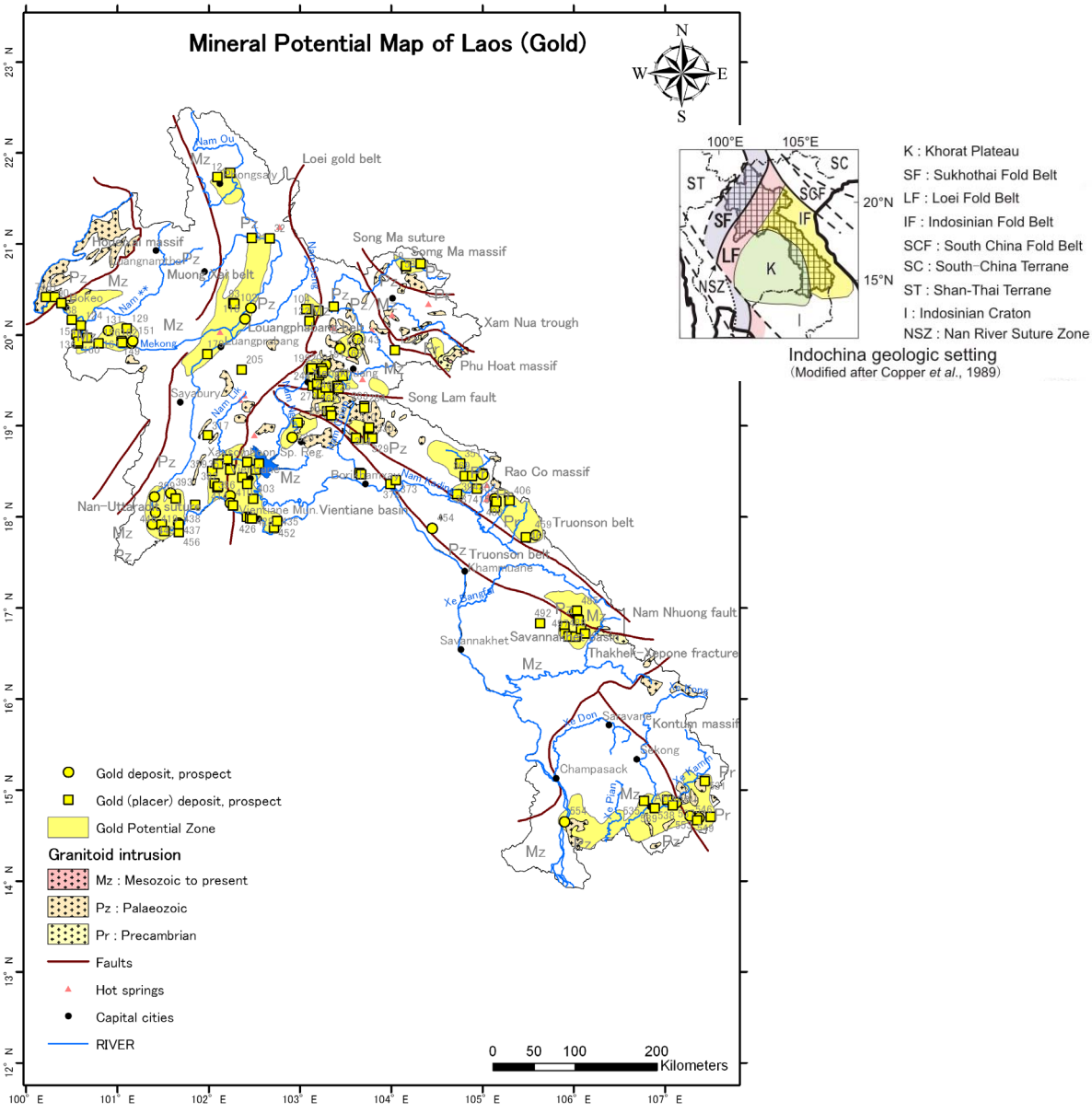


Fig. 4 Gold Potential Map of Laos

Gold deposits and prospects in Laos are widely distributed in three fold belts, with the exception of the Khorat plateau (Fig. 4). In these areas, there are numerous epithermal gold deposits and prospects, and placer gold deposits along rivers. There are 35 gold deposits and prospects, and 115 placer gold deposits (Appendix 2). Gold deposits are distributed throughout the territory of Laos. Placer gold deposits are found in the Khorat plateau near Vientiane city, but they originated in the gold deposits of the Loei fold belt.

Looking closely at the location of gold potential zones, gold deposits in Laos are distributed around granitic rocks of the Late Paleozoic era, and near and along the large-scale tectonic lines trending NNE-SSW and NW-SE. Taking a broader view of gold location, the Sepon gold deposit, which is a Carline type gold deposit, and the Phu Bia gold deposit, which is an oxide gold cap after a primary porphyry copper deposit, are distributed near fracture zones along tectonic lines. They are thought to be haven formed by Late Paleozoic granitic rock activity.

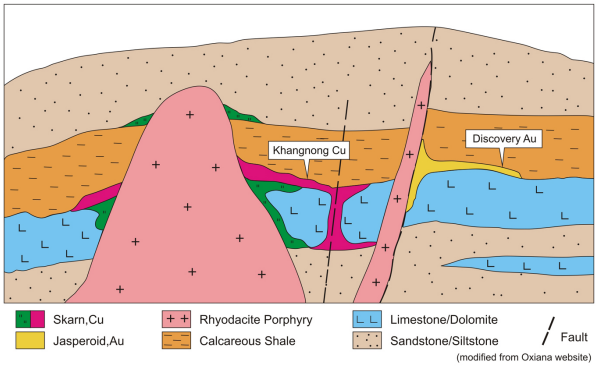


Fig. 5 Schematic Profile of the Sepon deposit

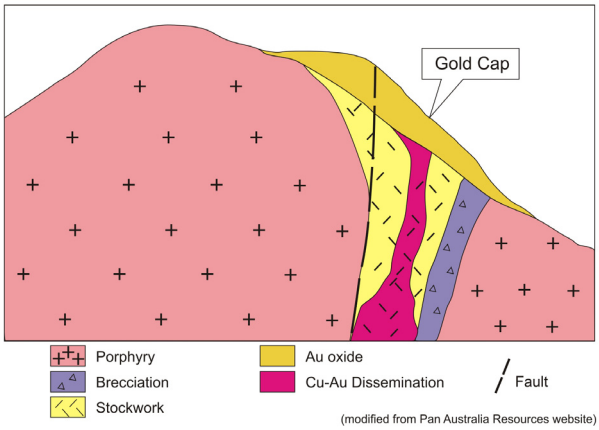
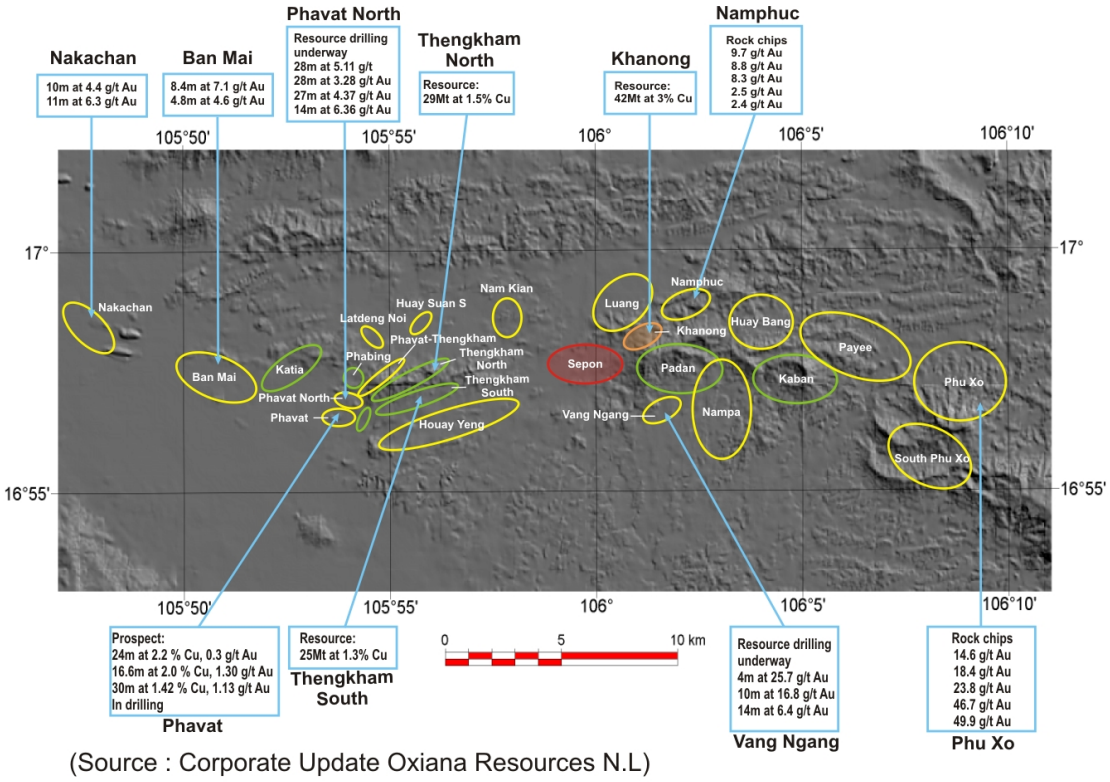


Fig. 6 Schematic Profile of the Phu Bia deposit

Fig. 5 shows a schematic profile of the Sepon deposit provided through the Web site of Oxiana Limited. Fig. 6 shows a schematic section of the Phu Bia deposit announced by Pan Australia Resources Limited. The gold and copper mineralization in both deposits is known to be controlled by fracture zones and granitic rocks

In an area extending 40 km from east to west, and 20 km from north to south near the Sepon gold-copper project, the Oxiana company has implemented a large-scale systematic exploration (Fig.7). In addition to the Discovery gold deposit group whose gold reserves amount to 48.8 t, gold prospects such as Nakachan, Ban Mai, Phavat, Namphuc, Vang Ngang, and Phu Xo have been discovered. In addition to the Khanong deposit, skarn type copper deposits, such as Thengkhan North (resources: 29 million ton at 1.5% Cu), and Thengkhan South (resources: 25 million ton at 1.3% Cu) have been confirmed for exploitation. Moreover, copper prospects at Katia, Padan and Kaban have been found. Thus, this area might have a gold potential of 4 to 5 times the presently confirmed gold ore reserves.



(Source : Corporate Update Oxiana Resources N.L)

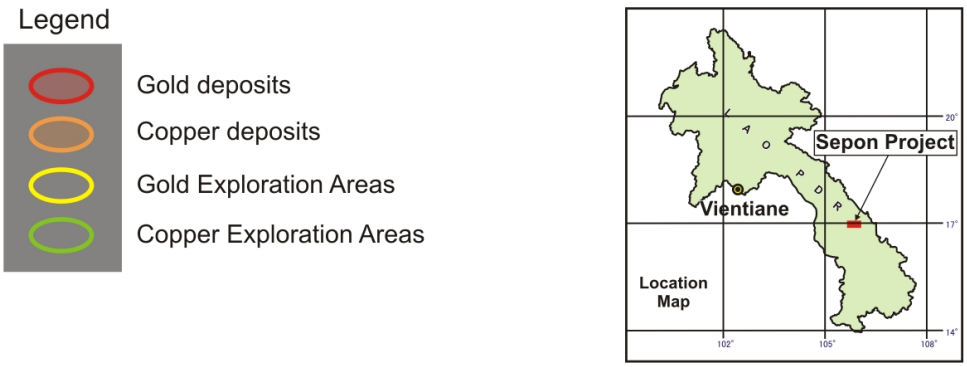


Fig. 7 Potential Area of the Sepon Gold-Copper Project

Based on the geological setting of Laos in the Indo-China peninsula, gold and copper potential is described below. The Chatree gold deposit, an epithermal vein type in Thailand, is located in the southwestern extension of the Loei fold belt. The gold deposit has been developed as the first open pit mine in Thailand. Ore reserves of the mine amount to 8.6 million t with 2.7 g/t Au and 12 g/t Ag. This has drawn attention to the gold potential zone in the Loei fold belt in Laos.

Also, numerous small-scale gold-bearing quartz veins occur in the mountainous regions in northern Vietnam. Their gold grade ranges from 7 to 137 g/t.

The Indosinian fold belt might underlie the Khorat plateau. Thus, an area where the Khorat plateau is thin and tectonic lines trend NW-SE has a high potential for gold deposits.

Fig. 8 shows a schematic longitudinal section along Laos, NW-SE axis showing where gold, copper and zinc (lead) deposits and prospects are presumed to exist.

Generally speaking, in Laos, exploration activity for gold has not been sufficiently implemented, despite the fact that Laos has high potential for gold. At present, there are 72t of

known gold reserves in Laos. Judging from the distribution of gold deposits, mineralization, and numerous discoveries in the Sepon region, gold potential in Laos could be possibly 500 t to 600 t or more.

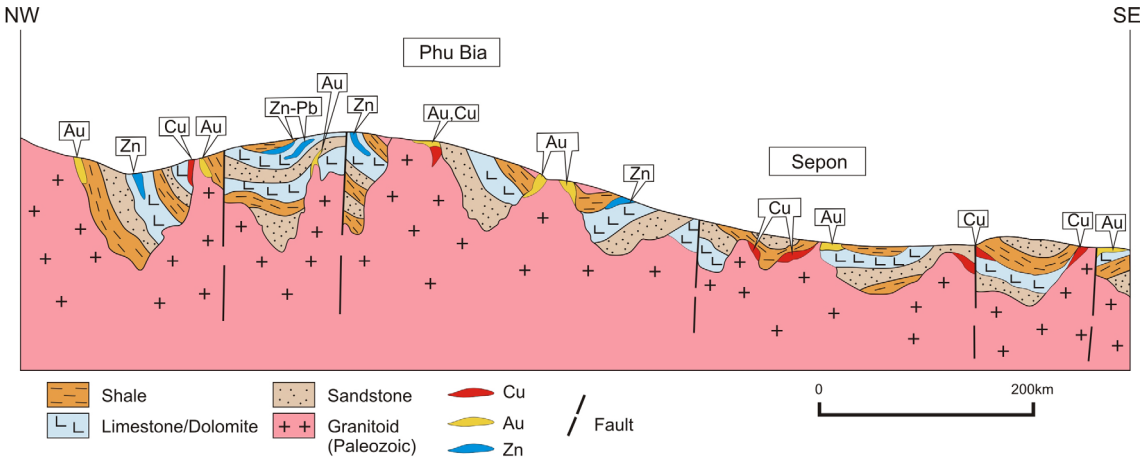


Fig. 8 Schematic Longitudinal Section of Mineral Deposit Distribution in Laos

4.2 Copper Potential Areas

Copper deposits and prospects in Laos are widely distributed in three fold belts, in addition to the Khorat plateau. Numerous deposits are especially distributed in the Indochinese fold belt (Fig. 9). There are 45 copper deposits and prospects (Appendix 2).

Copper deposits and prospects in the Indosinian fold belt are concentrated around granitic rocks of the Late Paleozoic era in Xiang Khoang province where the Phu Kham copper deposit was formed, and gather around granitic rocks of the Late Paleozoic era in Champasak province. Other copper deposits in the Sukhothai fold belt are concentrated in the north of Oudomxay province.

The Khanong copper deposit (skarn type) in the Sepon mine and the Phu Kham copper deposit (porphyry copper type) are related to granitic rocks, such as diorite and tonalite, of the Late Paleozoic era. Fracture zones have developed near these copper deposits. The granitic rocks intrude calcareous sedimentary rocks, and skarn-type copper deposits lie replacing calcareous rocks.

Copper mineralization is divided into two types: one is porphyry copper-gold deposits forming quartz stockwork in granitic rocks, and the other is copper skarn deposits which have formed in and around country rocks. These types of copper deposits are important in Laos.

Numerous copper deposits are distributed in central and northern Thailand. In the southwestern extension of the Loei fold belt, the Phu Lon deposit (reserves 57 million t, 1.7-2.4% Cu, 0.4-0.6g/t Au), Phu Hin Lak Fai deposit (15 million t, 1% Cu), Phu Thong Daeng deposit (13 million t, 1% Cu), and Puthep deposit (120 million t, 0.43% Cu) have been confirmed and developed. Every deposit has been identified as a porphyry copper type, but the Phu Lon and Puthep deposits might be skarn type.

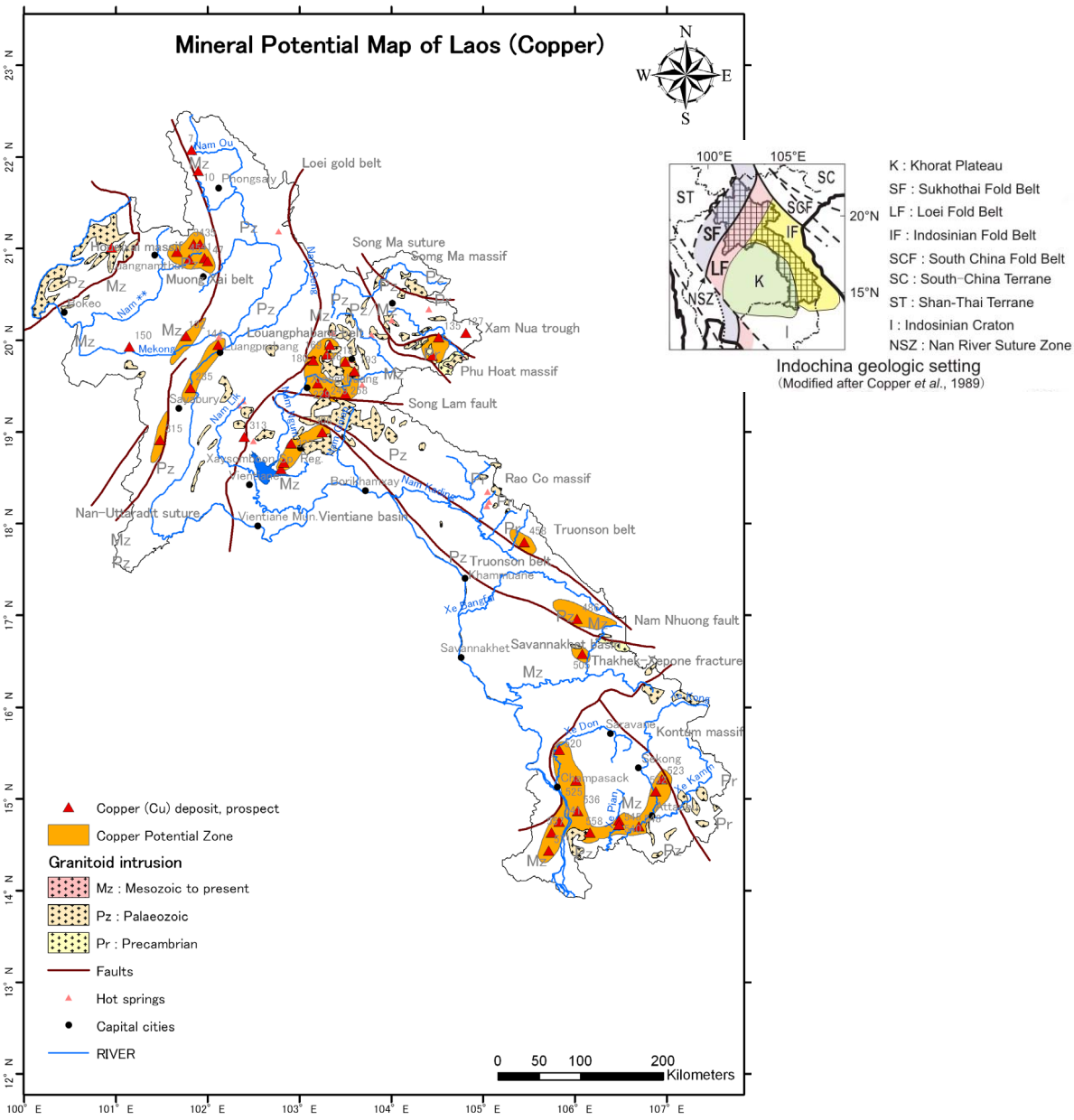


Fig. 9 Copper Potential Map of Laos

Exploration for copper in Laos has not been sufficiently implemented. Laos has a high potential for copper. At present, copper metal reserves in Laos account for 1.7 million t and resources account for 3.3 million t. Judging from the successful development of the Sepon copper deposit, the Phu Kham copper deposit, and features of copper mineralization, copper potential in Laos could possibly range from 8 to 10 million t of copper metal.

4.3 Lead and Zinc Potential Areas

Numerous lead and zinc deposits and prospects are distributed in the Loei fold belt and the north of the Indosinian fold belt (Fig. 10). There are 75 lead and zinc deposits and prospects (Appendix 2). Lead and zinc deposits and prospects in the Loei fold belt are found near the Mekong River in Vientiane and Luang Prabang provinces. The deposits and prospects are distributed in Xiang

Khoang and Houaphan provinces in the Indosinian fold belt, and in Champasak provinces of southern Laos.

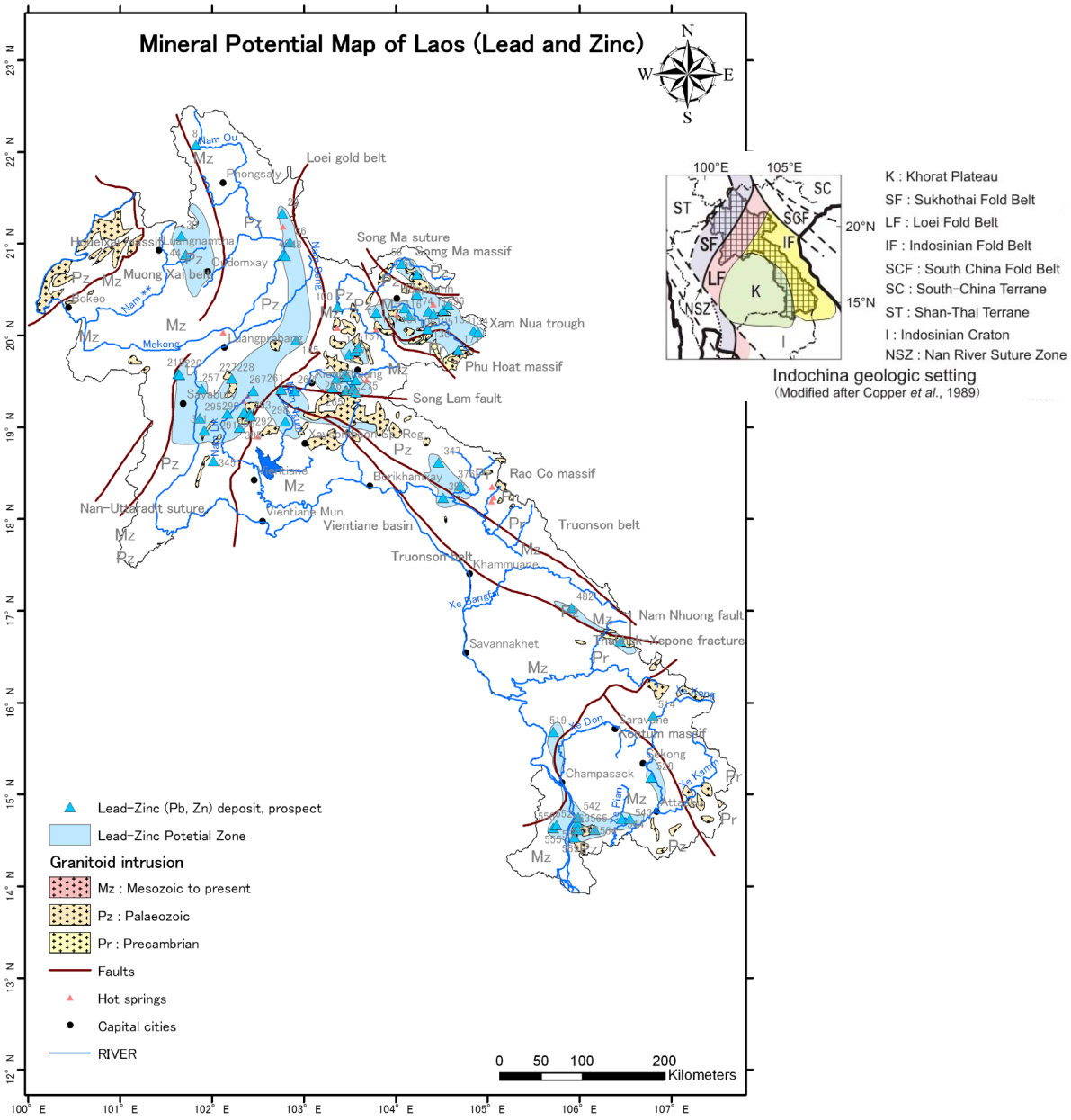


Fig. 10 Lead and Zinc Potential Map of Laos

Lead and zinc deposits are divided into skarn type, Mississippi Valley Type (MVT), and vein type. Strata surrounding ore deposits underlie calcareous rock of the Upper Paleozoic system, and those strata are favorable for country rocks of skarn type deposits and MVT.

Fig.11 shows a schematic section of a Missouri lead and zinc deposit model which is representative of MVTs listed in Mineral Deposit Models (1996) of USGS. The MVT is a strata-bound deposit of lead and/or zinc minerals in carbonate rocks. These deposits occur as veins, replacement bodies and brecciation, are marginal to sedimentary basins, and are without an obvious source of mineralization. One third of the world's lead and zinc resources occur in MVT deposit.

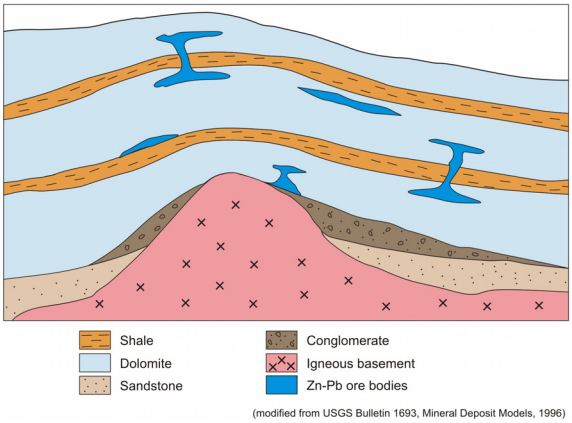


Fig. 11 Schematic Profile of a Mississippi Valley-type Deposit

At present, the only known zinc deposit in Laos is the Kaiso deposit in Vientiane province. Annual zinc production ranges from 3,000 to 40,000 t with 40 % Zn. In the Kaiso deposit, zinc silicate in the upper part of the orebody is mined, and zinc concentrates are sent to the Tak refinery plant near the Padaeng mine in western Thailand. The Padaeng zinc deposit is MVT, which contains 4.5million t of reserves with 29 % Zn (1.3 million t of zinc metal amount). The mine produces 100,000 t of crude ore. The Song Tho deposit lies 200 km south of the Padaeng mine, and produces lead and zinc. The Song Tho deposit is also MVT, and contains 8.5 million t of crude ore with 7 to 12 % Pb and Zn.

Lead and zinc deposits in Vietnam are distributed mainly in the northern mountainous region, and are located in the Indochinese fold belt and the South China fold belt. The deposits are divided into stratabound and hydrothermal types. Some of the stratabound deposits might be MVT. Cho Dien mine in the northeast consists of stratabound and vein type deposits and contains 3 million t of ore reserves with 11% Zn (0.3 million t of zinc metal) and 4.5 % Pb.

At the Pha Luang lead-zinc prospect in Vientiane province, high-grade lead and zinc ores having grades varying from 8 to 26 % of Pb and Zn were discovered in drilling exploration by Rox Resources, an Australian exploration and development company. It was announced that the lead and zinc ores had characteristics of MVT ore (Rox Resources' website)

There is a high potential for the existence of MVT in Laos, and more exploration focusing on MVT is needed in regions where carbonate rocks as limestone and dolomite are distributed. At present, only about 13,000 t of zinc metal reserves are known to exist. However, judging from the existence of lead and zinc deposits in Thailand and Vietnam, zinc potential in Laos could possibly range from 2 to 3 million t.

4.4 Tin Potential Areas

Tin deposits and prospects are distributed in the north and south of the Indochinese fold belt (Fig. 12), 37 have been located (Appendix 2). Tin deposits and prospects are concentrated in Vientiane, Xieng Khouang, Houaphan, Khammouane provinces, and Champasak province in the south.

Tin deposits are related to granitic rocks of the Late Paleozoic era. Cassiterite-bearing quartz veins and quartz networks exist. Though known tin ore reserves amount to 45 million t at present, they could increase with exploration activity.

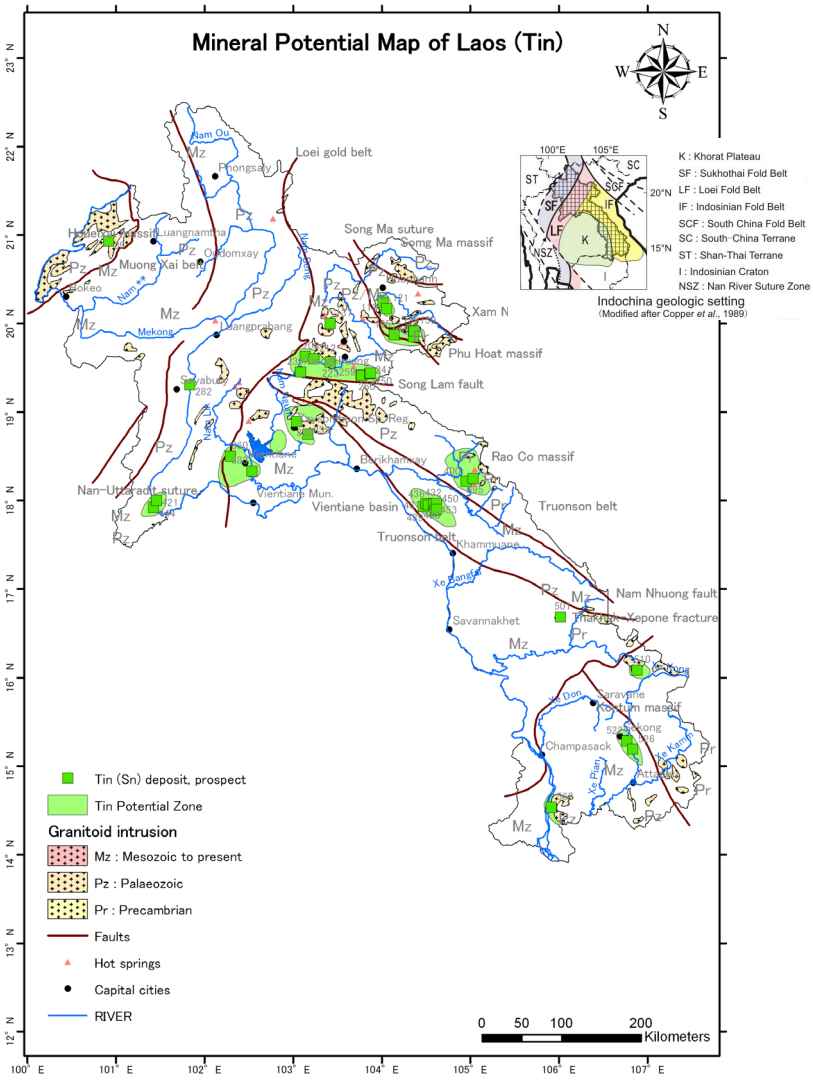


Fig. 12 Tin Potential Map of Laos

4.5 Potential of Other Mineral Resources

4.5.1 Coal

Coal is produced in Luangnamtha province in northern Laos, and in Vientiane province. Coal strata are intercalated among sandstone and siltstone of the La Khe formation of the Lower Carboniferous. The reserve amounts to 516 million t. Similar strata are distributed in Saravan and Sekong provinces in southern Laos. A lot of coal prospects remain unexplored within the country. The potential of coal may reach 700-800 million t based on their distribution.

4.5.2 Gypsum

Gypsum is produced in Khammouan and Savannakhet provinces. Gypsum occurs in thick evaporite of the Upper Cretaceous and its reserve amounts to 8 million t. The thick evaporite of the Upper Cretaceous is distributed over Vientiane, Bolikhamxay and Khammouan provinces in central Laos, and Savannakhet province in southern Laos. The potential of gypsum may reach 100 million t based on their distribution.

4.5.3 Potash Rock Salt

As with gypsum, potash rock salt occurs in the evaporite of the Upper Cretaceous, and its distribution is confirmed to be large in Vientiane and Savannakhet provinces. Potash salt deposits in Vientiane and Savannakhet sedimentary basins are large in Laos. Thickness of the deposit in Savannakhet province was confirmed to be 70-85m at drill holes (DGM-INTERGEO, 2005). The resource of potash salt may be as high as 50 billion t.

4.5.4 Kaolin

Regarding clay mineral such as kaolin, rhyolite of Permian to Triassic Period was altered into kaolinite and pyrophyllite. Rhyolite occurs in outcrops in Champasak province, which borders on Cambodia, and Vientiane and Xiengkhoung provinces. Reserves of clay containing kaolin amount to 5 million t and resource may be expected 70 million t.

4.5.5 Sapphire

In Ban Houei Sai in Bakeo province of northwestern Laos, sapphire occurs in placer deposits in tributaries of the Mekong River. In 2004, 710,000 carats of sapphire were mined. Because primary sapphire is formed in syenite and high-metamorphosed limestone, its genetic condition is restricted. Resource of sapphire amounts to 23 million carats, and potential of sapphire may be 30 million carats because of the limited formation environment.

4.5.6 Limestone

Limestone used for cement, construction aggregate, and road material occurs in many provinces, especially Xiengkhouang, Vientiane and Khammouan provinces. There are 14 million t of reserves and 2 billion t of resource. It will be easy to find outcrops of limestone as road are built in the future.

5. Status of Exploration

As of January 2006, 121 mining licenses had been granted. The types of mining licenses are: Reconnaissance, Exploration, Exploitation, and Small Exploitation. These licenses are held by 33 domestic and 35 foreign companies. These licenses are classified by country and by mineral type (Table 6 and Fig. 13). Thirteen Chinese companies have 24 licenses for copper, gold (including placer gold), lead, zinc, tin, antimony, coal, etc. Seven Vietnamese companies have 11 licenses for gypsum, placer gold, lead/zinc, tin, etc. Six Thai companies have 6 licenses for coal, lead/zinc, and limestone. Four Australian companies have 5 licenses for gold and gold/copper. Two Russian companies have entered into 4 gold licenses and one tin license. North Korea has two licenses (iron) and South Korea (sapphire) and Canada (iron) each have one license. Domestic companies have 66 licenses, which are composed of sapphire (15), barite (9), tin (7), coal (6), gold (5), placer gold (5), gypsum (4), and limestone (4).

Domestic companies focus on sapphire, barite, coal and placer gold where investment is minimal and mining technology is not required. On the other hand, it is clear that foreign capital from Australia, China, Vietnam and Thailand has advanced the development of base metals such as copper, copper/gold, and lead/zinc because of the large capital investment required. The locations of established mining licenses are added to the map of major mineral deposits (Fig. 3)

Table 6 Current Mining Licenses

(as of January 2006)

	Foreign Country									Domestic	Total
	China	Vietnam	Thailand	Australia	Russia	Canada	N. Korea	Korea	Subtotal		
Companies	13	7	6	4	2	1	1	1	35	33	68
Licenses by kind of mineral	24	11	6	5	5	1	2	1	55	66	121
Coal	2	1	2						5	6	11
Au/Cu				3					3		3
Alluvial Au	2	1							3	5	8
Au	2			2	4				8	5	13
Cu	8								8	2	10
Pb, Pb/Zn	2	1	2						5	2	7
Sb	2								2		2
Sn	1	1			1				3	7	10
Fe	1	1				1	2		5		5
Al	1								1	1	2
Sapphire								1	1	15	16
Gypsum		2							2	4	6
Limestone	1	1	2						4	4	8
Clay	1	1							2	3	5
Mudstone		1							1	1	2
Potash	1	1							2		2
Barite										9	9
Rock salt										2	2

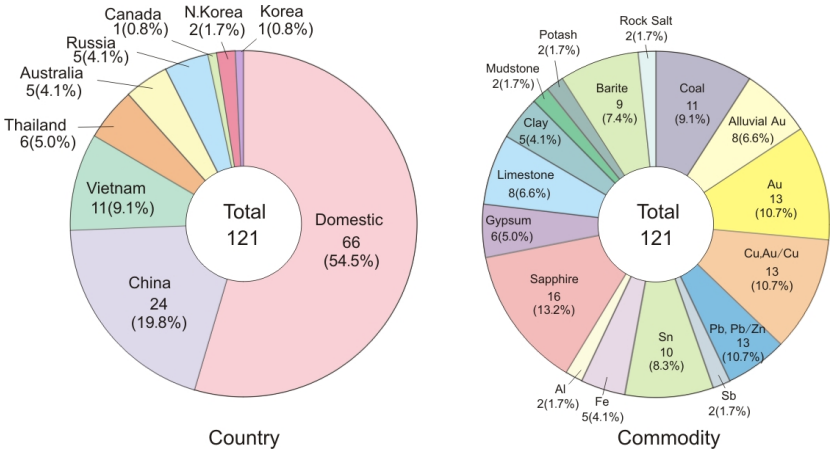


Fig. 13 Classification of Mining Licenses

6. Economic Evaluation of Metallic Deposits

In this Chapter, gold, copper, and zinc deposits, which are important to the Laotian economy, are evaluated economically.

6.1 Preconditions

6.1.1 Developing Models of Mineral Deposits and Technology

Taking account of mineral deposits according to their characteristics, scale, and grade, as confirmed in Laos, and using additional mineral resources information from Vietnam, Thailand, and Cambodia, models of mineral deposit development are created as shown in the five cases in Table 7. Copper, zinc and gold are simulated because of their economic value as commodities.

Table 7 Models of Copper, Zinc, and Gold Deposit Development

Metal Type	Scale	Ore Reserves	Grade	Contained Metal	Annual Metal Product	Mining and Processing Method
Copper	Large	26,000,000 t	2.5% Cu	650,000t Cu	52,500 t Cu	Open Pit, SXEW
	Small	4,5000,000 t	3.0% Cu	135,000t Cu	13,100 t Cu	Underground, Concentrating
Zinc	Middle	4,000,000 t	8.0% Zn	320,000 t Zn	30,000 t Zn	Underground, Concentrating
Gold	Large	17,000,000 t	3.0g/t Au	51t Au	4.9 t Au	Open Pit, CIL
	Small	1,000,000 t	2.5g/t Au	4 t Au	380 kg Au	Open Pit, CIP

6.1.2 Metal Prices

The transition of LME prices for gold, silver, copper, lead, zinc, and tin are shown in Appendix 4. This shows the monthly changes for 15 years from January 1991 to December 2005. Table 8 shows the minimum, maximum, and average LME prices. Metal prices are decided based on the balance of the supply and demand. These prices are less stable than those of general consumer goods. For instance, the price of copper rose from 1,400 $/t to 3,000 $/t between 1991 and 2003, but the price began soaring in 2004, exceeding 4,500 $/t at the end of 2005, and has continued rising since. This upswing originated in the increase of demand in BRICs such as China etc. The prices of base metals, including copper, are hitting new highs.

Table 8 Minimum, Maximum and Average Metals Prices

Metal	Minimum	Maximum	Average	Unit
Gold	256.14	509.76	346.86	US$/oz
Silver	3.64	8.69	5.10	US$/oz
Copper	1,377.28	4,577.00	2,189.30	US$/Mt
Zinc	747.24	1,821.83	1,052.35	US$/t
Lead	375.39	1,124.00	590.73	US$/t
Tin	3,694.50	9,459.47	5,733.83	US$/t

(Source: LME from Jan. 1991 to Dec. 2005)

6.1.3 Methods of Economic Evaluation and Simulation

Initial capital costs and working costs are determined, according to the scale of the developing model. Products, production, mining and processing costs, treatment costs, sales conditions (T/C and R/C), transportation costs, royalties, and income taxes are constructed according to information gleaned from interviews with mining-related organizations in Laos, as well as FS and mining data from foreign countries.

Initial capital costs in a large-scale copper mine model and a large-scale gold mine model are determined in reference to the capital costs of the Sepon mine and the Phu Bia mine (Table 9). A detailed description of the initial capital cost is shown in the final report by the infrastructure expert (FR-4). The total capital cost at the Sepon gold mine in 2002 was calculated at about US$ 40 million (6.2t of gold product in 2005), and the capital cost at the Sepon copper mine in 2003 was calculated at about US$ 170 million (30,000t of copper product in 2005). The total capital cost at the Bhu Bia gold mine in 2004 was calculated at about US$ 15 million (1.6t of gold product in 2005).

Table 9 Capital and Working Costs of Gold and Copper Mines

	Mined Crude Ore (Mt/a)	Capital Cost (US million $)	Additional Infrastructure Cost (US million $)	Estimated Capital Cost (US million $)	Estimated Working Cost (US million $)
Sepon Gold Mine	2.6 (2005)	40			
Phu Bia Gold Mine	0.4 (2005)	15			
Large-scale Gold Mine (Developing Model)	1.8 (estimated)	40	3	43	8
Sepon Copper Mine	1.2 (2005)	170			
Large-scale Copper Mine (Developing Model)	2.9 (estimated)	170	0	170	34

The capital cost of a large-scale copper mine model is assumed to be US$ 170 million, which is the same capital cost as the Sepon copper mine. The capital cost of a large-scale gold mine model is assumed to be US$ 43 million, because US$ 3 million of additional infrastructure and construction costs is added to the US$ 40 million capital cost for the Sepon gold mine (Table 9).

Working capital in this developing model is assumed to be 20% of the amount of the capital cost, compared to 20-25% of the capital investment seen in mining projects in recent years (Table 9). For instance, the working capital of a large-scale gold mine is assumed to be US$ 8 million, and a large-scale copper mine is assumed to be US$ 34 million. The base operating cost of mining and processing in a large-scale copper mine (open pit, SXEW) is US$ 20 per ton of crude ore. This is calculated based on operating costs of US 35-38 cents per pound of electrolytic copper at the Sepon copper mine (DGM data). The base operating cost of mining and leaching in a large-scale gold mine (open pit, CIL) is US$ 20 per ton of crude ore. This is calculated based on operation costs of US$ 201 per troy ounce of electrolytic gold in the Sepon gold mine (Oxiana Corporate Update, March 2006). Currently in Laos, royalties are assumed to be 2.5 % of revenue, and cooperate income taxes are assumed to be 35 % of the profit. For cash flow analysis, NPV and IRR are simulated on the basis of a 10-year long production plan (Appendix 5).

6.2 Results of Economic Evaluation

As metal prices fluctuate greatly, it is extremely difficult to anticipate trends in metal prices ten years into the future. Therefore, based on the above-mentioned average metal prices of the last 15 years (from January 1991 to December 2005), sensitivity analyses of NVP and IRR by metal price were performed by constructing 3 cases with the average prices, and higher and lower than average prices. In general, a discount rate is considered more attractive for investors. Thus, the discount rate here was assumed to be 15 %, using a standard calculation, more than the Prime Rate

of 8.25% (the last reported rate, effective since June 29, 2006) of the United States, and LIBOR 4.84% (one year GBP, June 3, 2006) of Britain.

Table 10 NPV and IRR Variations for a Large-scale Copper Mine Model

Cu Price ($/t)	1,700	2,200	2,700
NPV (million $)	-70	3	75
IRR	4 %	15 %	25 %

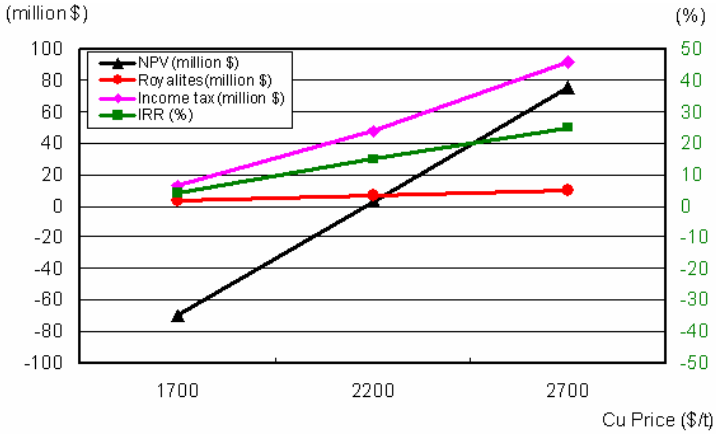


Fig. 14 Sensitivity Analysis of Metal Prices, NPV, IRR, Royalties and Income Tax (Large-scale Copper Mine Model)

Table 11 NPV and IRR Variations for a Small-scale Copper Mine Model

Cu Price ($/t)	1,700	2,200	2,700
NPV (million $)	-9.1	9.0	27.1
IRR	7 %	22 %	35 %

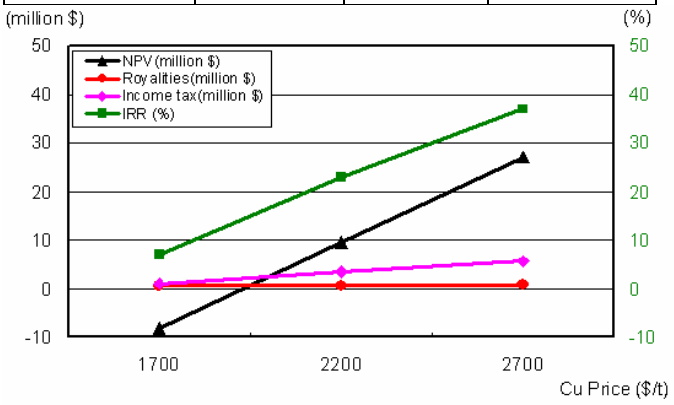


Fig. 15 Sensitivity Analysis of Metal Prices, NPV, IRR, Royalties and Income Tax (Small-scale Copper Mine Model)

The results of the sensitivity analyses are shown in Tables 10, 11, 12, 13 and 14 and Figures 14, 15, 16, 17 and 18. The annual royalties and the income taxes are shown below from Fig.14 to Fig. 18.

Table 12 NPV and IRR Variations for a Middle-scale Zinc Mine Model

Zinc Price ($/t)	800	1,000	1,200
NPV (million $)	-2.4	14.2	30.8
IRR	13 %	23 %	33 %

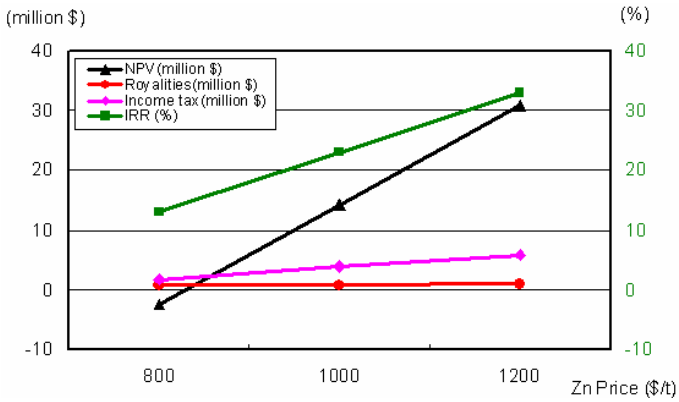


Fig. 16 Sensitivity Analysis of Metal Prices, NPV, IRR, Royalties and Income Tax (Middle-scale Zinc Mine Model)

Table 13 NPV and IRR Variations for a Large-scale Gold Mine Model

Gold Price ($/oz)	300	350	400
NPV (million $)	-9.5	12.5	34.4
IRR	9 %	22 %	33 %

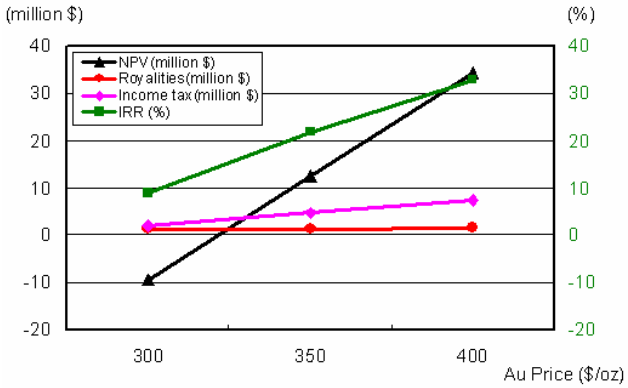


Fig. 17 Sensitivity Analysis of Metal Prices, NPV, IRR, Royalties and Income Tax (Large-scale Gold Mine Model)

Table 14 NPV and IRR Variations for a Small-scale Gold Mine Model

Gold Price ($/oz)	300	350	400
NPV (million $)	0.5	2.2	3.9
IRR	18 %	30 %	41 %

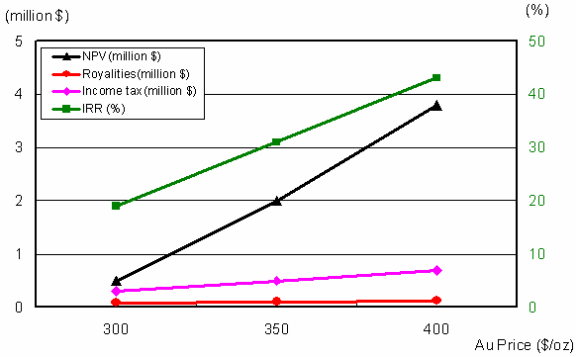


Fig. 18 Sensitivity Analysis of Metal Prices, NPV, IRR, Royalties and Income Tax (Small-scale Gold Mine Model)

Table 15 lists annual corporate revenue, total cost, profit, royalties and income taxes by metal price for model copper, zinc, and gold deposits.

Table 15 Annual Revenue, Total Cost, Profit, Royalties and Income Taxes by Metal Price

Mine Type	Scale	Metal Price	C. Revenue (million $)	T. Cost (million $)	Profit (million $)	Royalties (million $)	Income Taxes (million $)
Cu Mine	Large	Cu 1,700 $/t	89.4	58.4	11.7	2.2	4.1
		Cu 2,200 $/t	115.6	58.4	37.3	2.9	13.1
		Cu 2,700 $/t	141.9	58.4	63.0	3.5	22.0
Cu Mine	Small	Cu 1,700 $/t	22.8	16.0	3.2	0.6	1.1
		Cu 2,200 $/t	29.3	16.0	9.6	0.7	3.4
		Cu 2,700 $/t	35.9	16.0	16.0	0.9	5.6
Zn Mine	Middle	Zn 800 $/t	29.4	17.0	7,7	0.7	2.7
		Zn 1,000 $/t	35.4	17.0	13.6	0.9	4.7
		Zn 1,200 $/t	41.4	17.0	19.4	1.0	6.8
Au Mine	Large	Au 300 $/oz	47.7	36.5	5.7	1.2	2.0
		Au 350 $/oz	55.6	36.5	13.4	1.4	4.7
		Au 400 $/oz	63.5	36.5	21.2	1.6	7.4
Au Mine	Small	Au 300 $/oz	3.7	2.4	0.9	0.09	0.30
		Au 350 $/oz	4.3	2.4	1.5	0.11	0.51
		Au 400 $/oz	4.9	2.4	2.1	0.12	0.72

The results of the simulations of cash flow in 10-year production plans show that several proposed development models are profitable at the 1991-to-2005 15-year average metal price. When considering Laotian future resource potential, the values calculated in this simulation will provide fundamental modeling data for mining development scenarios on assumed numbers of mineral deposits until 2025.

In Fig.14 to Fig. 18, royalties (2.5 % of revenue) and corporate income taxes (35 % of profit) were set at fixed rates. In this case, if the rates are fixed, and metal prices soar, there is no significant advantage to the Laotian government, but it is very advantageous for the developing enterprise. However, using a variable royalty rate, the royalties are raised gradually in connection with rises in metal prices. In Table 16, the royalties and income tax were calculated for a large-scale copper mine model. Corporate income tax is fixed at 35 % and royalties were gradually increased from 2.5 % to 5 %.

Based on the LME copper price of 7,420 $/t as of August 30, 2006, the maximum copper price was assumed to be 7,000 $/t. Operating costs were also synchronized with the copper price and the total costs were increased by as much as 30%. Table 16 shows how the annual revenue of Laotian government increases when the royalty changes from 2.5 % to 5 %. For instance, when the LME copper price is 7,000 $/t and the royalty changes from 2.5 % to 5 %, annual revenue increases US$ 6 million. Fig.19 shows the profit, the royalties and corporate income tax when the copper price changes.

Table 16 Government Revenue Increase with Variable Royalty Rate

	Copper price	(US$/t)	1,700	2,200	2,700	3,000	3,500	4,000	4,500	5,000	6,000	7,000
Fixed Royalty Rate	Corporate Revenue	(million $)	89	116	142	158	184	210	237	263	315	368
	Total Cost	(million $)	58	58	58	61	61	64	64	70	76	76
	Profit	(million $)	12	37	63	75	101	124	149	169	215	266
	Royalties (at 2.5% fixed rate)	(million $)	2	3	4	4	5	5	6	7	8	9
	Income Tax	(million $)	4	13	22	26	35	43	52	59	75	93
	Annual Government Revenue	(million $)	6	16	26	30	40	48	58	66	83	102
Variable Royalty Rate	Corporate Revenue	(million $)	89	116	142	158	184	210	237	263	315	368
	Total Cost	(million $)	58	58	58	61	61	64	64	70	76	76
	Profit	(million $)	12	37	63	75	100	122	147	155	207	257
	Royalty Rate		2.5%	2.5%	2.5%	3.0%	3.0%	3.5%	3.5%	4.0%	5.0%	5.0%
	Royalties	(million $)	2	3	4	5	6	7	8	11	16	18
	Income Tax	(million $)	4	13	22	26	35	43	51	58	72	90
	Annual Government Revenue	(million $)	6	16	26	31	41	50	59	69	88	108
Revenue Increase		(million $)	0	0	0	1	1	2	1	3	5	6

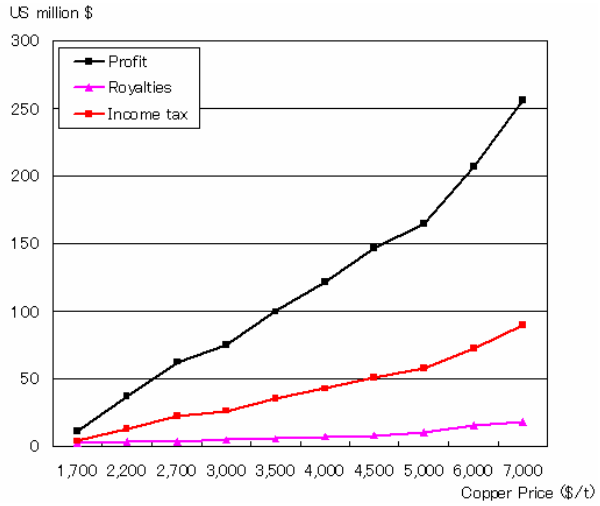


Fig. 19 Profit, Royalties and Income Tax when Using a Variable Royalty Rate

On the other hand, if the copper price falls below a constant level, for instance, it slowly falls to 1,500 $/t, reconsideration of the minimum royalty becomes necessary because government plans will be hindered if a minimum annual government revenue is not secured.

Corporate income tax and royalty rates that synchronize with fluctuations in metal prices need to be reconsidered in the future. Revision of the taxation system is proposed in the Action Plan (separate volume).

Prices of industrial raw materials have risen because of the high price of crude oil, and metal prices are skyrocketing at present. Thus, we need to consider the extent to which fluctuations in production costs due to raw material price increases can impact the economic performance of mine operations. Sensitivity analyses of operating costs were performed by constructing 3 cases with 5 %, 10 % and 20 % raises compared with the base of the average metal price. The fluctuations in profit before tax are summarized in Table 17.

Table 17 Profit Variations by Operating Cost at Metal Mine Models

Mine Type	Scale	Metal Price	Operating Cost Increase	0 %	5 %	10 %	20 %
Cu Mine	Large	Cu 2,200 $/t	Profit (million $)	37.3	34.4	31.5	25.7
			Profit Decrease		-8%	-16%	-31%
Cu Mine	Small	Cu 2,200 $/t	Profit (million $)	9.6	8.8	8.0	6.4
			Profit Decrease		-8%	-17%	-33%
Zn Mine	Middle	Zn 1,000 $/t	Profit (million $)	13.6	12.7	11.9	10.2
			Profit Decrease		-7%	-13%	-25%
Au Mine	Large	Au 350 $/oz	Profit (million $)	13.4	11.5	9.8	6.1
			Profit Decrease		-14%	-27%	-54%
Au Mine	Small	Au 350 $/oz	Profit (million $)	1.5	1.3	1.2	1.0
			Profit Decrease		-8%	-17%	-33%

These calculations show that with a 10 % rise in operation costs, profits decrease 13 % to 27 % depending on the mine scale, commodity, and mining and processing methods. This shows that rising prices of crude oil and raw materials put pressure on mine managers because the mining company can not increase metal prices to compensate.

Through further exploration activity, new deposits might be discovered in Laos and could be exploited according to the model. Laos has the potential to exploit 5 copper deposits, such as the Ban Houei Mo copper deposit but not including the Sepon and the Phu Kham copper deposits, 5 zinc deposits, such as the Phuda and Pha Luang zinc deposits, and 10 gold deposits, such as the Phapon and Sakay gold deposits.

7. Economic Evaluation of Industrial Materials

Industrial material deposits of gypsum, kaolin and potash salt are economically evaluated in this Chapter.

7.1 Preconditions

7.1.1 Developing Models of Industrial Materials and Technology

Taking account of mineral deposits according to their characteristics, scale, and grade, as confirmed in Laos, and using additional mineral resources information from Thailand and Malaysia, models of mineral deposit development are created as shown in the three cases in Table 18.

Table 18 Models of Gypsum, Kaolin and Potash Salt Deposit Development

Mineral	Scale	Reserves	Grade	Contained	Annual Product	Mining Method
Gypsum	Small	5,000,000 t	$CaSO_4 2H_2O$ 96%	SO_3 45%	80,000 t Gypsum	Open Pit
Kaolin	Small	4,000,000 t	Al_2O_3 20%	Al_2O_3 35%	102,000 t Kaolin (Al_2O_3 35%)	Open pit
Potash Salt	Small	20,000,000 t	KCl 18%	K_2O 11%	62,000 t KCl 100% conversion	Open Pit

Market grade kaolin is usually over 35 % Al_2O_3. Because the average grade of kaolin in Laos is low, with 20 % Al_2O_3, a kaolin mine to secure high-grade ore or to introduce selective mining is required. Therefore, a mineral dressing plant is installed at the kaolin mine.

7.1.2 Prices

The prices for gypsum, kaolin and potash salt in Laos are listed in Table 19, based on the sales prices of an operating mine in Laos, and the export price to Japan from Thailand, Malaysia and China.

Table 19 Prices of Gypsum, Kaolin and Potash Salt

Mineral	Price	Unit
Gypsum	22	US$/ t
Kaolin	80	US$/ t
Potash Salt	160	US$/ t

7.1.3 Methods of Economic Evaluation and Simulation

In addition to metallic deposits, initial capital costs and working costs are determined, according to the scale of the development model. Products, production, mining and processing costs, transportation costs, royalties, and income taxes are estimated based on information gleaned from interviews with mining companies in Laos, as well as FS data.

Initial capital investments in the three models are calculated including necessary heavy equipment, such as drilling machines, and loading equipment, on an individual operating scale. The royalties are assumed to be 2.5 % of revenue, and the income taxes are assumed to be 35 % of the profit, the same as in the metallic mine models. For cash flow analysis, NPV and IRR are calculated based on a 10-year production plan (Appendix 6).

7.2 Results of Economic Evaluation

The prices shown in Table 19 are estimates. The actual prices of the commercial transactions are decided by the negotiations of the producer and customer, along with the quality and

consistency of the product, and the market demand. Therefore, sensitivity analyses of NVP and IRR by price were performed for 3 cases: the above-mentioned prices, and higher and lower prices. The results of the sensitivity analyses are shown in Tables 20, 21, and 22, and Figures 20, 21, and 22.

Table 20 NPV and IRR Variations for a Small-scale Gypsum Mine Model

Gypsum Price ($/t)	20	22	24
NPV ('000 $)	-432	33	497
IRR	5 %	16 %	25 %

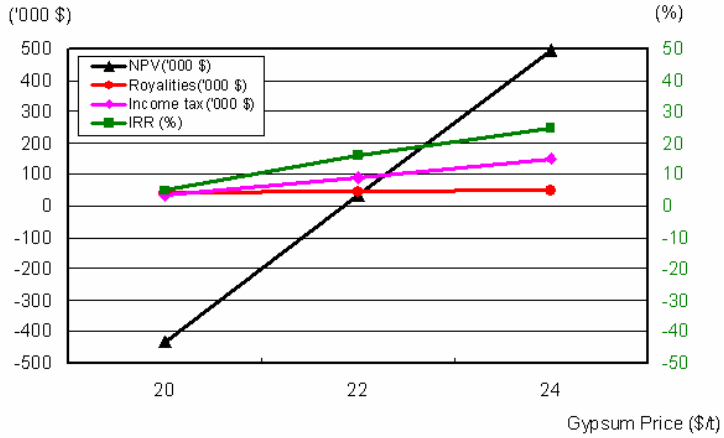


Fig. 20 Sensitivity Analysis of Prices, NPV, IRR, Royalties and Income Tax (Small-scale Gypsum Mine Model)

Table 21 NPV and IRR Variations for a Small-scale Kaolin Mine Model

Kaolin Price ($/t)	70	80	90
NPV ('000 $)	-1,046	1,797	4,618
IRR	10 %	23 %	34 %

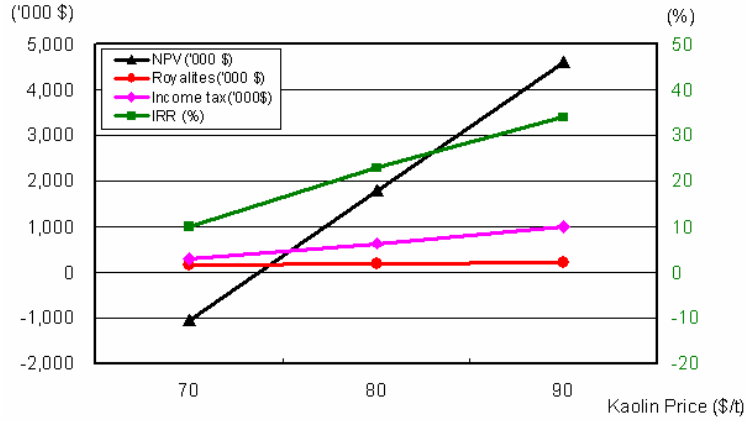


Fig. 21 Sensitivity Analysis of Prices, NPV, IRR, Royalties and Income Tax (Small-scale Kaolin Mine Model)

Table 22 NPV and IRR Variations for a Small-scale Potash Salt Mine Model

KCl ($/t)	140	160	180
NPV ('000 $)	787	2,830	4,873
IRR	18 %	25 %	32 %

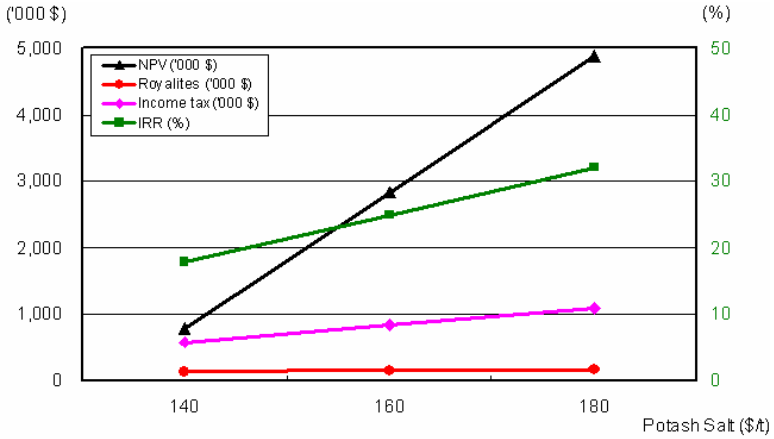


Fig. 22 Sensitivity Analysis of Prices, NPV, IRR, Royalties and Income Tax (Small-scale Potash Salt Mine Model)

Table 23 summarizes corporate revenue, total cost, profit, royalties and income taxes based on the prices of gypsum, kaolin and potash salt deposits.

Table 23 Annual Revenue, Total Cost, Profit, Royalties and Income Taxes by Price

Mine Type	Scale	Price	C. Revenue ('000 $)	T. Cost ('000 $)	Profit ('000 $)	Royalties ('000 $)	Income Taxes ('000 $)
Gypsum	Small	Gypsum 20 $/t	1,680	1,428	100	42	35
		Gypsum 22 $/t	1,848	1,428	264	46	92
		Gypsum 22 $/t	2,016	1,428	428	50	150
Kaolin	Small	Kaolin 70 $/t	7,140	5,610	832	179	291
		Kaolin 80 $/t	8,160	5,610	1,826	204	639
		Kaolin 90 $/t	9,180	5,610	2,821	230	987
Potash Salt	Small	KCl 140 $/t	5,171	2,723	1,668	129	584
		KCl 160 $/t	5,910	2,723	2,389	148	836
		KCl 180 $/t	6,648	2,723	3,109	166	1,088

The results of the simulations of cash flow in 10-year production plans show that several proposed development models are profitable at the estimated prices. When considering Laotian resource potential for gypsum, kaolin and potash salt in the future, the values calculated in this simulation will provide fundamental modeling data for mining development on assumed numbers of mineral deposits until 2025. Through further exploration activity, new deposits might be discovered in Laos and could be exploited according to these models.

As in the development models of metallic deposits, the extent to which fluctuations in production costs due to raw material price increases can impact the economic performance of mine

operations in non-metal mines needs to be considered. Sensitivity analyses of operating costs were performed for 3 cases, with 5 %, 10 % and 20 % increases compared with the base average price. Table 24 summarizes the fluctuations of profit before taxes.

Table 24 Profit Variations by Operating Cost for Non-metal Mine Models

Mine Type	Scale	Price	Rising Rate of Operating Cost	0 %	5 %	10 %	20 %
Gypsum Mine	Small	Gypsum 22 $/t	Profit ('000 $)	264	192	121	-22
			Profit Decrease		-27%	-54%	-108%
Kaolin Mine	Small	Kaolin 80 $/t	Profit ('000 $)	1,826	1,546	1,265	704
			Profit Decrease		-15%	-31%	-61%
Potash Mine	Small	KCl 160 $/t	Profit ('000 $)	2,389	2,252	2,116	1,844
			Profit Decrease		-6%	-11%	-23%

These calculations show that with a 5 % rise in operating costs, the profit decreases by 6 % to 27 %. The profit is reduced by half when operating costs rise by 10% in the gypsum mine, and the profit becomes loss with a 20 % rise in operating costs. The increased costs of crude oil and raw materials will certainly have a major impact on the management of non-metal mines whose products are lower in price than metals.

8. Mineral Potential and Investment Promotion

In the development of mineral resources in Laos, commodities, the scale of mineral deposits, and the appropriate type of enterprise for exploration of mineral deposits and development of mines, will be determined based on the results of economic evaluation.

In Laos, copper and gold deposits are presumed to be large-scale mines. Technology and capital are necessary for exploration and development of large-scale deposits, and international enterprises are most appropriate as the developers. Junior companies are considered appropriate in the exploration stage, and large European or American companies are considered appropriate in the development stage.

Copper, zinc, and gold deposits are appropriate as the object of medium-scale mines. Because technology and capital are necessary for exploration of medium-scale deposits as well as large-scale deposits, international enterprises are again the most appropriate developers. According to the scale of development, medium-size European or American enterprises are considered.

Table 25 Mineral Potential and Investment Promotion

Scale	Commodity	Potential for Exploitation	Reserves	Business Scale (US mil. $)	Best Companies	Limitations of Attraction	Investment Promotion
Large	Copper	High	Cu > 1 Mt	100 – 300	International (Large company)	- MEPA - Shortage of information, engineers and technicians - Infrastructure (road, electricity)	- Entry of Junior - Geological survey by DGM
	Gold	High	Au > 50 t	50 – 150	International (Large or Mid-size company)		
Medium	Copper	High	Cu 0.5 – 1 Mt	50 – 100	International (Mid-size company)	- MEPA -Shortage of information, engineers and technicians - Infrastructure (road, electricity) - UXO	- Entry of Junior - Geological survey by DGM
	Zinc	High	Zn 0.3 – 1 Mt	20 – 60	International (Mid-size company)		
	Gold	High	Au 5 – 50 t	20 – 50	International (Mid-size company)		
Small	Copper	High	Cu < 500 kt	2 – 50	International (Mid-size company) Thailand, China	- Shortage of information and technology - Funds - Engineers and technicians	- Support of exploration - Loan and financing system - Technical guidance
	Gold	High	Au < 5 t	2 – 20	Laos, Vietnam, International (Mid-size company)		
	Zinc	High	Zn < 300 kt	5 – 20	Thailand, Vietnam		
	Tin	Medium	Sn < 100 kt	0.5 – 20	Laos		
	Sapphire	Medium	< 5 M cts	0.5 – 1	Laos		
	Kaolin	High	< 10 Mt	0.5 – 10	Thailand		
	Gypsum	High	< 10 Mt	0.3 – 3	Laos		
	Potash Salt	High	< 50 Mt	0.5 – 25	Thailand		
	Construction Materials	High	< 10 Mt	0.1 – 1	Laos		

According to the mineral commodities in small-scale deposits, medium-size European or

American enterprises, companies from neighboring countries (Thailand, Vietnam and China), or joint ventures between Laotian companies and companies from neighboring countries are considered most appropriate as developers. Tin placer deposits, sapphire, gypsum, and construction materials could be developed by Laotian companies.

When exploration and development of deposits is executed, there are various limitations due to dearth of information, legal restrictions, incompleteness of technology, engineer shortages, and funding. The promotion plan addresses each issue with the goal of development.

9. Capacity Building Program

Laos has a high potential for numerous mineral deposits to be exploited, judging from the development of the Sepon gold and copper deposits, and the planned development of the Phu Bia gold deposit, and the Phu Kham copper project. To promote exploration and development of mineral resources with domestic and foreign investment, DGM needs to arrange and increase its research data for exploration, and to obtain concise data on mineral potential. Accordingly, it is important that the following projects be carried out. It proposes to undertake the projects shown in Fig. 23 as a capacity building program by the World Bank for eight years. Total working expense will be approximately US$ 20.7 million as shown in Table 26. Royalties and taxes from operating mining projects and development projects should also be considered as possible funding sources for the following projects.

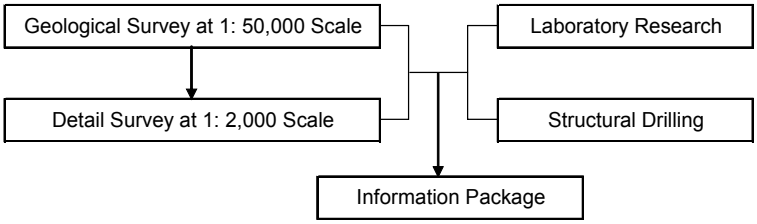


Fig. 23 Flow of Capacity Building Program

Table 26 Draft Capacity Building Program

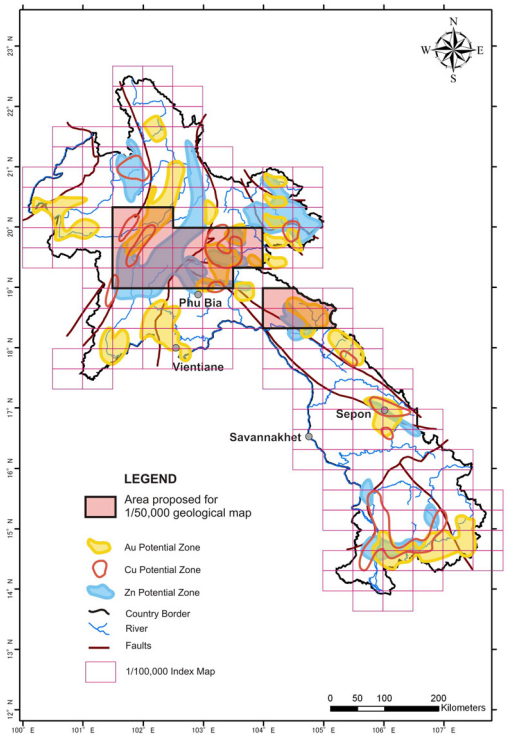
			Phase 1				Phase 2			
Projects	Budget (million US$)	Contents	1st year	2nd year	3rd year	4th year	5th year	6th year	7th year	8th year
1/50,000 geological map	12.0	24 sheets	3 sheets	3 sheets	3 sheets	3 sheets	4 sheets	4 sheets	4 sheets	
			US$ 1.5 million	US$ 1.5 million	US$ 1.5 million	US$ 1.5 million	US$ 2.0 million	US$ 2.0 million	US$ 2.0 million	
1/2,000 detail survey	3.5	50 sheets				10 sheets	10 sheets	10 sheets	10 sheets	10 sheets
						US$ 0.7 million	US$ 0.7 million	US$ 0.7 million	US$ 0.7 million	US$ 0.7 million
Information package	0.7	100 sheets					25 sheets	25 sheets	25 sheets	25 sheets
							US$ 0.18 million	US$ 0.18 million	US$ 0.18 million	US$ 0.18 million
Laboratory research	0.5	1 set			microscopes, analytical equipments					
					US$ 0.2 million	US$ 0.3 million				
Structural drilling	4.0	500m x 20holes						8 holes	8 holes	4 holes
								US$ 1.6 million	US$ 1.6 million	US$ 0.8 million
Total	20.7		US$ 1.5 million	US$ 1.5 million	US$ 1.7 million	US$ 2.5 million	US$ 2.9 million	US$ 4.3 million	US$ 4.5 million	US$ 1.7 million

In consideration of the limited capital, and keeping in the mind that promoting the prospecting and development of the mineral resources of Laos would be advanced effectively, priority was assigned to each project and its development in the fiscal year. It is assumed the eight-year program will be divided into two four-years phases. The business expense of Phase 1 amounts to US$ 7.2 million and Phase 2 amounts to US$ 13.5 million and total business expense amounts to US$ 20.7 million.

a) Geological maps at the 1:50,000 scale (24 sheets) ---------- US$ 12 million

Twenty-four areas will be selected, surveyed, and prioritized according to their mineral potential. Twelve areas will be selected in each phase and geological surveys of those

areas will be carried out at a scale of 1:50,000. Information on the geology, geological structure and alteration should be obtained, as well as the characteristics of mineralization. Research data should be rendered in GIS format, and digital maps and explanations should be created. The breakdown of expenditure about US$ 500,000 which costs in one-area making of geologic map at 1:50,000 is shown in Appendix 7-1.



Judging from the potential distribution of gold, copper, and the zinc described with Chapter 5, Bolikhamxay province in central-eastern Laos where the potential of gold is large, and Xiengkkhouang and Luangprabang provinces and the northern part of Vientiane province and eastern part of Sayaburi province in north-central Lao where the potential of copper, gold and zinc is large, are enumerated as candidate areas for 1:50,000 geological surveys (Fig. 24). These are as comprise 80 sheets at 1:50,000 and 24 areas will be selected from previous data and the 1:200,000 geological maps.

Fig.24 Area Proposed for 1:50,000 Geological Survey

b) Surveys in promising areas (50 sheets) ---------- US$ 3.5 million

For promising areas selected from the survey at scale of 1:50,000, detailed geological surveys will be performed at a scale of 1:2,000. Surveyed data should be rendered in GIS format and published as a brochure inventory of mineral deposits. The breakdown of expenditure about US$ 70,000 which costs in one-area making of geologic map at 1:2,000 is shown in Appendix 7-2.

c) Publication of promising mineral deposits (100 sheets) ---------- US$ 0.7 million

Each deposit will be summarized on 4 sheets of A4-paper. The summaries of "information packages" will be sold as a public service. Records of exploration, geology and mineral deposits, reserves and resources, grades and schematic geological profiles will be attached. Brief information will be published on a Web site. The breakdown of expenditure about US$ 70,000 which costs in one-set making of information package is shown in Appendix 7-3.

d) Laboratory research for geology and minerals ---------- US$ 0.5 million

Features of geology and mineral deposits will be analyzed by microscopic observation, and instrumental analysis of rocks, minerals and ore. After using the data to create mineral deposit models for use in exploration, the data will be rendered in GIS

format. The breakdown of expenditure about US$ 500,000 which costs in one set of analytical equipment is shown in Appendix 7-3.

e) Structural drilling (500m/hole, 20 holes, 10,000m in total length)---------- US$ 4 million

Structural drilling should be done to confirm geology and structure at depth on a nationwide scale. A structural drilling of 500m class is executed and 20 holes are drilled around the country. All the resultant data will be rendered in GIS format with profiles. This data is supplied as national basic information for land conservation, disaster prevention and subterranean resources. The breakdown of expenditure about US$ 200,000 which costs in one drilling and data analysis is shown in Appendix 7-4.

End of Report

APPENDICES

Appendix 1 List of Geological map (1/200,000)

	Index No. Topographic map	Name of map	Published year	Organization	Digital/analog	Language	Remarks
1	27, 33	Sam Neua	1982	Vietnam / DGM	Digital	English	Vietnamese explanation
2	2	Khangkhay	1983	Vietnam / DGM	Digital	English	Vietnamese explanation
3	12	Vientiane	1985	Vietnam / DGM	Digital	English	Vietnamese explanation
4	9	Mok	2000	Vietnam / DGM	Digital	English	English explanation
5	15	Khamkbut	2000	Vietnam / DGM	Digital	English	English explanation
6	16	Nape	2000	Vietnam / DGM	Digital	English	English explanation
7	21	Thathek	2000	Vietnam / DGM	Digital	English	English explanation
8	22	Mahaxai	2000	Vietnam / DGM	Digital	English	English explanation
9	23	Ayen	2000	Vietnam / DGM	Digital	English	English explanation
10	28	Donghen	2000	Vietnam / DGM	Digital	English	English explanation
11	27	Xeno	2000	Vietnam / DGM	Digital	English	English explanation
12	29	Xepon mai	2000	Vietnam / DGM	Digital	English	English explanation

Appendix 2 Inventory of Mineral Deposits and Resources of Laos (1)

No.	MINERAL	PROVINCE	DISTRICT	LONGITUDE	LATITUDE	TYPE	NOTES
1	Coal	Phongsaly	Nhotou	102.01250	22.37083		Q = 4,247 - 7,680 kcal/kg
2	Halite	Phongsali	Muong Ou	101.76667	22.33333	evaporite	Middle Mesozoic, present working
3	Halite	Phongsali	Muang Ou	101.55810	22.23889	evaporite	Middle Mesozoic, presently worked.
4	Gypsum	Phongsali	Ban Pho	101.75000	22.21667	evaporite	Middle Mesozoic
5	Halite	Phongsali	Muang Ou Tai	101.79170	22.12083	evaporite	
6	Coal	Phongsali	Sop Pong	102.03330	22.08334	coal	Late Paleozoic; 6-9% volatiles, 56-68% fixed carbon, 20% ash
7	Cu	Phongsali	M. Yoth Ou	101.82639	22.08056	hydrothermal	Phu Taxan copper deposit(Puda Cu-Pb-Zn deposit), Fracture zone with clay alteration, quartz vein, sulfide dissemination
8	Zn	Phongsali	M. Yuewu	101.82639	22.08056	hydrothermal	Puda Cu-Pb-Zn deposit,Fracture zone with clay alteration
9	Halite	Phongsali	Bo Nang	101.75000	21.91667	evaporite	Middle Mesozoic ; presently worked
10	Cu	Phongsali	Ngay Nua	101.90000	21.85000		
11	Au	Phongsali	Houay Ka	102.23310	21.78000	alluvial	
12	Au	Phongsali	Houai Ka	102.08920	21.73500	alluvial	
13	Fe	Phongsali	Muang Ma	102.23310	21.73500		
14	Fe	Phongsali	Muang Wa	102.08920	21.71694		unexplored
15	Coal	Phongsali	Phongsali	102.10000	21.70000	coal	Late Paleozoic; 22.2% ash, 5.9% volatiles; presently worked
16	Coal	Phongsaly	Phongsaly	102.10000	21.70000		Q= 5,809 - 8,220 kcal/kg,Ash= 13.83 - 36.7 %
17	Coal	Phongsali	Bun Nua	102.01670	21.66667	coal	Early Mesozoic
18	Halite	Phongsali	Muang Boun Neua	101.90000	21.63611	evaporite	
19	Halite	Phongsali	Bo Khoune	101.75000	21.46667	evaporite	Middle Mesozoic; presently worked
20	Lignite	Phongsali	Bun Tai	102.08330	21.46667	coal	Late Paleozoic; Anthracite; volatiles 20% (Saurin 1954)
21	Sb	Louangnamtha	Bouak Het	101.08333	21.43333		
22	Pb	Phongsali	Sop Nao	102.76670	21.33334		
23	Halite	Phongsali	Muang Boan Tai	101.79190	21.28500	evaporite	
24	Coal	Phongsali	Muang Mai	102.75000	21.21667	coal	Early Mesozoic
25	Halite	Oudomxai	Boten	101.66670	21.20000	evaporite	Middle Mesozoic ; presently worked
26	Sb	Phongsali	Sop Nao	102.78333	21.20000		
27	Lignite	Louangnamtha	Muang Sing	101.18330	21.18333	lignite	Neogene
28	Mn	Oudomxai	Ban Houay Lak	101.81670	21.18333		
29	Lignite	Oudomxai	Ban Ai	101.83330	21.08334	lignite	Neogene
30	Zn, Pb	Louangnamtha	Na Teuy	101.66667	21.08333	hydrothermal	
31	Au	Phongsali	Nam Phak	102.46670	21.06667	alluvial	
32	Au	Phongsali	Nam Hou	102.66530	21.06000	alluvial	previously worked
33	Coal	Oudomxay	Namo	101.82500	21.05806		Q = 5,000 KCal/Kg; Ash = 48.6-63.1%,Moisture=9.4-9.9%
34	Cu	Louangnamtha	Nam Phak	101.85000	21.05000		
35	Cu	Oudomxai	Phu Thong	101.91667	21.05000		old working
36	Pb	Louangphrabang	Muang Xay	102.85000	21.01667		
37	Cu	Louangnamtha	M. Long	100.95556	21.01361	hydrothermal	Ban Houei Mo copper deposit(Yin Shui Shan Cu deposit), Bornite, chalcopyrite, chalcocite, magnetite
38	Cu	Oudomxai	Ban Namo	101.66667	20.96667		
39	Sn	Louangnamtha	Ban Meo	100.91670	20.93333		
40	Halite	Oudomxai	Muang Ngoun	101.83690	20.92500	evaporite	old working
41	Cu	Oudomxai	Tamklok	101.96667	20.90000		
42	Fe	Oudomxai	Ta Ngai	102.02080	20.90000		
43	Limestone	Khammouan	Thakhek	104.21667	20.90000	Stratiform	
44	Zn, Pb	Louangnamtha	Na Thong	101.71667	20.88333	hydrothermal	
45	Cu	Oudomxai	An Mai	101.80000	20.88333		
46	Pb	Louangphrabang	Muang Houp	102.77310	20.88000		antimonous
47	Cu	Oudomxai	Nachang	102.00000	20.86667		
48	Pb	Louangnamtha	Muong Houp	102.80000	20.86667		
49	Fe	Oudomxai	Muang La	102.10690	20.85306		locally worked
50	Mg	Houaphan	Sop Sao	104.07220	20.85000	heavy mineral	
51	Technetium	Houaphan	Sopsan	104.08333	20.85000		
52	Gypsum	Oudomxai	Natoung	101.83333	20.83333	evaporite	Middle Mesozoic
53	Mg	Houaphan	Xieng Kho	104.15000	20.81667	magnesite	
54	Halite	Oudomxai	Muang La	101.97190	20.79000	evaporite	
55	Halite	Oudomxai	Muang Xai	102.13330	20.78333	evaporite	Middle Mesozoic, present working
56	Pb	Houaphan	Ban Luang	104.06670	20.78333		
57	Asbestos	Houaphan	Ban Luang	104.08333	20.78333		
58	Au	Houaphan	Ban Muang	104.31940	20.78250	alluvial	
59	Au	Houaphan	Na Pieng	104.15970	20.75556	alluvial	
60	Cr	Houaphan	Houay Dic	104.11670	20.75000	heavy mineral	
61	Mn	Houaphan	Na Pieng	104.18060	20.74639	heavy mineral	

Appendix 2 Inventory of Mineral Deposits and Resources of Laos (2)

No.	MINERAL	PROVINCE	DISTRICT	LONGITUDE	LATITUDE	TYPE	NOTES
62	Fe	Houaphan	Ban Ta Hene	104.24030	20.71944		old Chinese working
63	Limestone	Khammouan	Thakhek	104.46667	20.71667	Stratiform	
64	Cr	Houaphan	Nam Long	104.21670	20.70000	heavy mineral	
65	Pb	Houaphan	Phou Ngeuane	104.23330	20.66667		previously worked
66	Coal	Luangnamtha	Ngeun	101.03333	20.64528		Q = 4,900 to 5,200 KCal/Kg; Avg= 5,000 KCal/Kg ,Ash= 10% - 15%; Avg= 12.5%.,S = 1.2% to 2.2%; Avg= 1.7%.
67	Fe	Louangphrabang	Nam La	102.45220	20.64000		
68	Fe	Houaphan	M. Nadone	104.15417	20.62778	hydrothermal	Marcasite- Pyrite, marcasite, pyrite ,Hydrothermal
69	Fe	Houaphan	Phu Lek	104.15000	20.61667	skarn	
70	Fe	Houaphan	Phulek	104.17690	20.61000	skarn	
71	Au	Louangphrabang	Ban Kong	102.58330	20.58333		
72	Lignite	Louangnamtha	Muang Ngeun	101.13330	20.50000	lignite	Neogene
73	Limestone	Samneua	Liad	104.40528	20.48167	Stratiform	CaO 24%, MgO 0.53%, SO2 0.46%
74	Pb (Ag, Au)	Houaphan	Phu Ngeuane	104.23333	20.45000	volcanic	old working
75	Clay	Samneua	BanKo	104.01056	20.43611	Alluvial	
76	Lignite	Houaphan	Ban O	104.01670	20.43333	lignite	
77	Pyrite	Houaphan	Na Done	104.05000	20.43333		old working
78	Mn	Houaphan	Nam Nga	104.15390	20.42222		
79	Au	Bokeo	Nam Jao	100.21470	20.41806	alluvial	aval du Nam Khuong
80	Clay	Samneua	BanNathong	104.05556	20.41806	Alluvial	
81	Au	Bokeo	Nam Khoung	100.31330	20.41667	alluvial	trib on left of Mekong north of Nam Ngao; co-ord from atlas to Repertoire
82	Clay	Samneua	HoueiMi	104.04583	20.40000	Alluvial	
83	Limestone	Samneua	Xiengluang	104.21667	20.40000	Stratiform	CaO 54%, MgO 0.69%, SO2 0.09%
84	Limestone	Houaphan	Viengxay	104.21667	20.40000	sedimentary rock	present working
85	Halite	Houaphan	Viengxay	104.21670	20.40000	sedimentary rock	presently worked
86	Mn	Houaphan	Nakay	104.21670	20.38333		
87	Mn	Houaphan	Xieng Louang	104.27940	20.36667	heavy mineral	
88	Au	Bokeo	Ban Houayxai	100.38330	20.35000	alluvial	Quaternary
89	Gem	Bokeo	Ban Houei Sai	100.38333	20.35000	alluvial	Quaternary, present working
90	Au	Bokeo	Ban Houei Sai	100.38333	20.35000	alluvial	Quaternary
91	Au	Louangnamtha	Ban Nam Nga	102.26667	20.35000	alluvial	
92	Fe	Houaphan	Na Luong	104.29170	20.34167		
93	Au	Louangphrabang	Ban Nam Nga	102.27810	20.34000	alluvial	previously worked
94	Fe	Houaphan	Muang Khonte	103.34000	20.34000		
95	Lignite	Houaphan	Muang Ham	104.01670	20.33333	lignite	Neogene
96	Pb	Houaphan	Muang Poun	104.57330	20.33000		argentiferous; previously worked
97	Limestone	Samneua	Khangkhong	103.11806	20.31833	Stratiform	CaO 54%, MgO 2.88%, SO2 0.84%
98	Fe	Houaphan	Muang Pun	104.44440	20.31806		
99	Au	Houaphan	Pou Loi, Muang Kout	103.36750	20.31111	alluvial	co-ord from atlas to Repertoire
100	Pb	Houaphan	Muang Kout	103.36750	20.31111		masses of galena in qtz conglom; co-ord from atlas to Repertoire
101	Pb	Houaphan	Phou Cheng	104.10000	20.30000	volcanic	
102	Au	Louangphrabang	Houay Tchick	102.45830	20.29500	alluvial	
103	Mn	Bokeo	Ban Xaichaleun	100.49028	20.28611	skarn	Ban Xaichaleun deposit,Pyrolussite?,Skarn
104	Au	Louangphrabang	Muang Moi	103.06670	20.28333	alluvial	Quaternary; previously worked
105	Pb	Houaphan	Ban Mone	104.51920	20.27695		argentiferous; old working
106	Pb	Houaphan	Muang Heo	104.35690	20.26806		previously worked
107	Au	Louangphrabang	Phou Loi	103.20000	20.26667	alluvial	Quaternary; previously worked
108	Fe	Houaphan	Houay Sang	104.53330	20.26667		old Chinese working. Tasseng Muang Phoun; coordinates for administrative district.
109	Clay	Samneua	MuongDong	104.06556	20.26250	Alluvial	
110	Fe	Houaphan	Muang Peun	103.79000	20.25000		
111	Pb	Houaphan	Muang Poun	103.79030	20.25000		galena in a spongy gangue
112	Gem (Beryl)	Houaphan	Ban Don	104.03333	20.25000		
113	Sn	Houaphan	Ban Na Khoun	104.01670	20.24167	heavy mineral	
114	Sb	Oudomxai	Houei Hoc	101.36667	20.23333		
115	Pb (Zn)	Houaphan	Ban Chat	104.41667	20.23333	hydrothermal	
116	Pb	Houaphan	Muang Ven	104.15000	20.21667		
117	Au	Houaphan	Ban Him	104.24720	20.17583		
118	Au	Louanprabang	M. PakOu	102.39722	20.17333	hydrothermal	Phapon gold deposit,Electrum, Quartz vein in limestone, sandstone and clay zone
119	Au	Bokeo	Ban Dane Tine	100.50000	20.16667	alluvial	
120	Lignite	Oudomxai	Muang Hun	101.41670	20.16667	lignite	Neogene
121	Sn	Houaphan	Ban Na Samong	104.05610	20.16667		
122	Au	Louangphrabang	Sop Sap	103.10000	20.15000	alluvial	Quaternary; previously worked

Appendix 2 Inventory of Mineral Deposits and Resources of Laos (3)

No.	MINERAL	PROVINCE	DISTRICT	LONGITUDE	LATITUDE	TYPE	NOTES
123	Au	Louangphrabang	Ban Hatkham	102.25000	20.11667		
124	Au	Oudomxai	Pak Tha	100.60000	20.10000	alluvial	Quaternary
125	Lignite	Houaphan	Muang Hiem	103.38330	20.08333	lignite	Neogene
126	Fe	Houaphan	Tche Pou Eune	104.10000	20.08333		old Chinese working on Houei Saia; coordinates for Muang Song-Khao.
127	Cu	Houaphan	Muong Pao	104.81667	20.08333		
128	Barite	Houaphan	Ban Kang	104.93330	20.08333	alluvial	
129	Au	Oudomxai	Houay Tone	101.09920	20.07000	alluvial	previously worked
130	Pb	Houaphan	Muong Heo	104.35000	20.06667		
131	Au	Oudomxai	Koka	100.90000	20.05000	hydrothermal	
132	Cu	Louangnamtha	Phu Thung	101.76667	20.05000		
133	Pb	Houaphan	Lolek/Banhang	104.85000	20.05000		
134	Pb	Houaphan	Lolek / Banhang	104.89690	20.03389		previously worked by Chinese
135	Cu	Houaphan	Na Mat	104.51667	20.03333		
136	Au	Oudomxai	Houay Soua	100.55030	20.00695	alluvial	
137	Sn	Houaphan	Tam Lao Tua	103.41670	20.00000	heavy mineral	
138	Fe	Houaphan	Tham La	103.40310	19.99806		old working to the N of Bo Thon
139	Fe	Houaphan	Muang Bo	104.06440	19.98945		
140	Cr	Oudomxai	Houay Teck	101.05000	19.98333	alluvial	
141	Lignite	Houaphan	Houa Xieng	104.25000	19.98333	lignite	Neogene
142	Au	Oudomxai	Hat Sa	100.66667	19.96667	alluvial	Quaternary
143	Au	Xiangkhouang	Ban Houay Peung	103.62810	19.95306	hydrothermal	pyrite vein in blocks; Au 0.5 gr/tonne, Ag 5 gr/tonne
144	Cu	Louangnamtha	Nam Leum	102.11667	19.95000		old working
145	Pb	Louangphrabang	Samton	102.91670	19.95000		
146	Cu	Xiangkhouang	Phu Po	103.33333	19.95000	skarn	
147	Gem (Almandine)	Houaphan	Houa Xieng	104.21667	19.95000		
148	Mo	Houaphan	Ban Houay Kat	104.60000	19.95000	geochemical anomaly	
149	Au	Oudomxai	Houay Song	101.04440	19.93556	alluvial	
150	Cu	Oudomxai	Pak Beng	101.15000	19.93333		
151	Au	Oudomxai	Pak Beng	101.16667	19.93333	hydrothermal	
152	Cr	Oudomxai	Houay Xeng	101.04280	19.92667	heavy mineral	
153	Coal	Louangphrabang	Nam Cham	102.06190	19.92611	stratiform	Anthracite; volatiles 4.3%, carbon 78%, ash 13.1%, sulphur 1.7% (Saurin 1954)
154	Au	Oudomxai	Houay Xa	100.56830	19.92583	alluvial	1 - 6 gr/ton; old working
155	Fe	Xiangkhouang	Ban Na Kham	103.43890	19.91695		
156	Au	Oudomxai	Houay Xeng	101.05000	19.91667	alluvial	8 - 14 gr/tonne
157	Coal	Louangnamtha	Nam Cham	102.08333	19.91667	coal	Late Paleozoic
158	Sn	Houaphan	Houay Cheun	104.35940	19.91667	metasomatic?	
159	Sn	Houaphan	Houei Cheun	104.36667	19.91667	metasomatic?	
160	Au	Oudomxai	Hat Sa	100.56810	19.90806	alluvial	Quaternary; 3 - 8.5 gr/m3
161	Au	Oudomxai	Nam Ngao	100.79310	19.90806	alluvial	
162	Au	Oudomxai	Pak Beng	101.15310	19.90806	hydrothermal	previously worked
163	Kaolinite	Xiangkhouang	Thamla	103.46670	19.90000	epithermal	
164	Clay	M.Pek,XiengKhouang	BanLatbouak	102.46667	19.89722	Alluvial	Al_2O_3 18%, SiO_2 61%
165	Sn	Houaphan	Ban Pha Don	104.14080	19.87500	heavy mineral	
166	Au	Houaphan	Ban Na Mong	104.52470	19.87500		
167	Pb,Zn	Xiangkhouang	Ban Na Mone	103.59190	19.87195		ancient working
168	Au	Xiangkhouang	Ban Houay Lun	103.43890	19.85389	hydrothermal	0.5 gr/tonne Au, 5 gr/tonne Ag.
169	Cu	Xiangkhouang	Ban Phatang	103.30000	19.85000	skarn	
170	Sn	Houaphan	Ban Sou Soi	104.35830	19.85000	heavy mineral	
171	Pb,Zn	Houaphan	Ban Hieng Dien	104.68330	19.84167	geochemical anomaly	
172	Pb	Xiangkhouang	Muongkao	103.56667	19.83333		
173	Au	Houaphan	Ban Souan Oi	104.03810	19.83333	alluvial	
174	Cu	Houaphan	Na Thong	104.45000	19.83333		
175	Mo	Xiangkhouang	Ban Namliang	103.30390	19.80889	vein	in amphibolite vein in fine grained granite; 0.03% Mo
176	Au	Xiangkhouang	Ban Na Tine	103.58310	19.80889	hydrothermal	pyrite vein; 0.5 gr/tonne Au, 5 gr/tonne Ag
177	Mo	Xiangkhouang	Ban Namliang	103.26667	19.80000		
178	Pb,Zn	Xiangkhouang	Muongkao	103.49310	19.80000		argentiferous; previously worked by Chinese
179	Au	Louangphrabang	Nam Khong	101.98060	19.79028	alluvial	incorrect general reference, confirmed by Annells (Oct 1990) at this locality
180	Cu	Xiangkhouang	Ban Tan	103.15000	19.78333		
181	Cu	Xiangkhouang	Ban Namun	103.50000	19.76667		

Appendix 2 Inventory of Mineral Deposits and Resources of Laos (4)

No.	MINERAL	PROVINCE	DISTRICT	LONGITUDE	LATITUDE	TYPE	NOTES
182	Fe	Xiangkhouang	Ban Phatang	103.35810	19.75500		of no interest
183	Mg	Xiangkhouang	Muang Mian	103.00000	19.71667	heavy mineral	
184	Fe	Xiangkhouang	Muang Khan	103.53780	19.71667	skarn	
185	Fe	Xiangkhouang	Ban Lac	103.22310	19.71000		Old open pit 80 km to the N of Xiengkhoang
186	Fe	Xiangkhouang	Phuthen	103.27700	19.71000	skarn	30cm thick massive magnetite at muscovite granite contact
187	Lignite	Oudomxai	Hongsa	101.28330	19.70000	lignite	Neogene; 53.23% volatile, 26.63% fixed carbon, 8.03% ash; extensive but inaccessible
188	Fe	Xiangkhouang	Phu Then	103.30000	19.70000		
189	Fe	Xiangkhouang	Phou San	103.20000	19.68333		
190	Mo	Houaphan	Ban Den Din	104.65000	19.68333	geochemical anomaly	
191	Au	Xiangkhouang	Xieng Ai	103.28610	19.67389	hydrothermal	pyrite quartz vein; 0.5 gr/tonne Au, 20 gr/tonne Ag
192	Fe	Xiangkhouang	Xieng Ai	103.26670	19.66667		
193	Cu	Xiangkhouang	Bothong	103.60000	19.66667	hydrothermal	
194	Fe	Xiangkhouang	Ban Nong	103.27920	19.65556	skarn	
195	Coal	Sayaburi	Hongsa	101.25000	19.65000		Q = 1,032 to 3,792 KCal/Kg; Avg= 2,493 KCal/kg ,Ash= 7.4% - 43.8%; Avg= 23.3%, S= 0.3% to 2.6%; Avg= 0.75%, Water= 15% to 40%; Avg= 30.5%.
196	Fe	Xiangkhouang	Ban Do	103.19610	19.64694		
197	Fe	Xiangkhouang	Ban Na Koun	103.22310	19.64694		some excavation of limonitic looking material
198	Mn	Xiangkhouang	Nam Mat	103.78330	19.64167	heavy mineral	
199	Au	Xiangkhouang	Nam Ngum	103.12500	19.63333	alluvial	
200	Au	Xiangkhouang	Ban Song Hat	103.23333	19.63333	alluvial	Quaternary
201	Fe	Xiengkhuang	M. Phek	103.23333	19.63056	skarn	Ban Mone deposit, magnetite 75-80%,Skarn
202	Fe	Xiangkhouang	Ban Mon	103.22310	19.62889		Gisement Tran-Ninh 1905
203	Sn	Xiangkhouang	Song Hat	103.13500	19.62778	heavy mineral	
204	Au	Xiangkhouang	Nam Ngum	103.12080	19.62500	alluvial	Quaternary
205	Au	Xiangkhouang	Ban Song Hat	102.35890	19.62000	alluvial	Quaternary; previously worked
206	Fe	Louangphrabang	Ban Moune	102.41330	19.62000		
207	Fe	Xiangkhouang	Bo Thon	103.44810	19.62000		old working
208	Lignite	Xiangkhouang	Vam Hoa	103.73610	19.62000	lignite	one hours march north of Ban Khane Pha Nieng (Saurin 1954)
209	Au	Xiangkhouang	Nam Ngum	103.11667	19.61667	alluvial	Quaternary, old working
210	Fe	Xiangkhouang	Ban Mon	103.31667	19.61667		
211	Au	Xiangkhouang	Ban Muon	103.25000	19.60194	alluvial	
212	Sn	Xiangkhouang	Lat Buoc	103.23330	19.60000	heavy mineral	
213	Mn	Xiangkhouang	Phou Hok	103.38330	19.60000		
214	Mn	Xiangkhouang	Ban Sinmun	103.55000	19.60000	heavy mineral	
215	Limestone	Xiangkhouang	Houay Xuong	103.76110	19.58889	sedimentary rock	Carboniferous - Permian limestone
216	Pb,Zn	Xiangkhouang	Muang Kha	103.45700	19.58389		
217	Clay	Xiengkhoung	Lathouang	103.23611	19.58333	Alluvial	Al_2O_3 21%, SiO_2 55%
218	Pb	Xaignabouri	Pha Vangsouane	101.63333	19.58333		
219	Au	Xiangkhouang	Ban Namone	103.23333	19.58333	alluvial	Quaternary
220	Pb	Xaignabouri	Phavangsouane	101.64810	19.57500		very fine grains
221	Lignite	Xiangkhouang	Ban Khane Pha Niong	103.80830	19.57500	lignite	volatiles 28.7%, fixed carbon 54.6%, ash 2.8%
222	Mg	Xiangkhouang	Nong Pet	103.40830	19.56667	heavy mineral	
223	Sn	Xiangkhouang	Nong Pet	103.41670	19.56667		
224	Au	Xiangkhouang	Ban Namone	103.20500	19.55694	alluvial	Quaternary; previously worked
225	Au	Xiangkhouang	Ban Kan Keo	103.46610	19.54806	alluvial	
226	Pb	Xiangkhouang	Ban Kan Keo	103.46610	19.54806	hydrothermal	Ag 120 gr/tonne
227	Pb	Louangnamtha	Muong Thadua	102.21667	19.53333		
228	Pb	Louangphrabang	Namtehong	102.21670	19.53333		
229	Cu	Xiangkhouang	Ban Po	103.20000	19.53333		
230	Fe	Louangphrabang	Houay Natchnong,	102.05310	19.53000		unexplored, low grade
231	Pb	Xiangkhouang	Pou Pha Nong	103.35830	19.53000		1 kg lead per 3 kg ore; locally worked
232	Pb	Xiangkhouang	Muong Kha	103.56667	19.51667		
233	Coal	Xiengkhouang	Nonghed	103.84722	19.51250		Q=6,133 to 6,537 KCal/Kg ; Avg=6,49 KCal/Kg,Ash=1.68 - 22.58 % ; Avg = 10.88 %,S= 0.5 - 2.35 % ; Avg = 1.45 %, Water= 10.45 - 21.47 % ; Avg = 16.50 %
234	Lignite	Xiangkhouang	Khangphanieng	101.85000	19.50000	lignite	present working
235	Cu	Xaignabouri	Muong Thadua	101.81667	19.48333		
236	Fe	Xiangkhouang	Pha Way	103.80000	19.48333		
237	Au	Xiangkhouang	Ban Nangoy	103.18330	19.46667	alluvial	
238	Lignite	Xiangkhouang	Muang Phan	103.45700	19.45806	lignite	Neogene; Charbon melange aux schists; analysis 33-35% volatiles, 5-16% ash, 36-39% fixed carbon
239	Sn	Xiangkhouang	Houay Pa	103.08330	19.45000	hydrothermal	

Appendix 2 Inventory of Mineral Deposits and Resources of Laos (5)

No.	MINERAL	PROVINCE	DISTRICT	LONGITUDE	LATITUDE	TYPE	NOTES
240	Mn	Xaignabouri	Muang Thadeua	101.81940	19.44167	geochemical anomaly	Mn 2000 ppm
241	Sn	Xiangkhouang	Chamun	103.86940	19.44167		
242	Halite	Xaignabouri	Ban Pong Pha	101.24310	19.44000	evaporite	
243	Halite	Xiangkhouang	Bo Sao	102.70110	19.44000	evaporite	
244	Au	Xiangkhouang	Nam Huock	103.13330	19.44000	alluvial	
245	Fe	Xiangkhouang	Ban Bo Thong	103.25890	19.44000		massive sulfur formation; 27% Fe, 0.03% Cu
246	Au	Xiangkhouang	Muang Pan	103.40330	19.44000	alluvial	
247	Pb	Xiangkhouang	Pak Luong	103.53810	19.44000		
248	Au	Xiangkhouang	Cha Mun	103.85830	19.43750		
249	Cu	Xiangkhouang	Nakhin	103.28333	19.43333		
250	Sn	Xiangkhouang	Chamun	103.86667	19.43333		
251	Fe	Xiangkhouang	Ban Yong	103.20500	19.43111		
252	Pb	Xiangkhouang	Ban Nam Seun Moi	103.31310	19.43111		ancient working in limestone in E-W direction.
253	Clay	Xiengkhoung	Khangphaniang	103.42028	19.43083	Alluvial	
254	Limestone	Xiengkhouang	Khangphaniang	103.42028	19.43083	Stratiform	
255	Au	Xiangkhouang	Nam Seun	103.27700	19.42194	alluvial	previously worked
256	Pb	Xiangkhouang	Ban Pha	103.53810	19.42194		
257	Pb	Louangphrabang	Ban Paksan	101.89220	19.41667	heavy mineral	
258	Cu	Xiangkhouang	Na Kin	103.50000	19.41667		
259	Sn	Xiangkhouang	Na Men	103.76667	19.41667		
260	Sn	Xiangkhouang	Na Men	103.77220	19.41389		
261	Pb	Xiangkhouang	Nam Tchuong	102.75500	19.41306		with 120-200 gr/ton silver
262	Au	Xiangkhouang	Nam Phan	103.42110	19.41306	alluvial	
263	Fe	Xiengkhouang	M. Khun	103.12944	19.40944	skarn	Phou Nhouan deposit,hematite-magnetite,Skarn
264	Coal	Xiengkhouang	Phane	103.41917	19.40806		Q= 3,461 to 6,661 KCal/Kg; Avg= 5,190 KCal/Kg,Ash= 21.26% to 33.60%; Avg = 27.40%.,S = 1.2% to 5.09%; Avg = 2.45%., Water= 11.48% to 16.96%; Avg= 14.35%.
265	Pb	Xiangkhouang	Pha Luong	103.45830	19.40417	hydrothermal	Devonian carbonate hosted
266	Pb	Xiangkhouang	Ban Pei	103.46610	19.40389	hydrothermal	analysis <35% Pb and 150 gr/ton Ag.
267	Pb	Louangphrabang	Phoukhoun	102.45000	19.40000		
268	Zn, Pb	Xiangkhouang	Thatsola	102.90000	19.40000		
269	Fe	Xiangkhouang	Nanou	103.23333	19.40000		
270	Fe	Xiangkhouang	Phu Nhouan	103.33333	19.40000	skarn	
271	Pb	Xiangkhouang	Pak Luong	103.45000	19.40000		
272	Lignite	Xiangkhouang	Muong Phan	103.48333	19.40000	lignite	Neogene
273	Limestone	Xiangkhouang	Ta Khet	103.22640	19.39167	sedimentary rock	Carboniferous - Permian limestone
274	Limestone	Xiengkhouang	Khoune	103.22639	19.39167	Stratiform	CaO 44-53%, MgO 0.3-3%, SO2 1.36%
275	Pb	Xiangkhouang	Ban Nampong	103.56670	19.38333		
276	Cr	Louangphrabang	Ban Phonsavan	101.86110	19.36389	geochemical anomaly	Cr 1000ppm
277	Clay	Xiengkhoung	Dongdane	103.27361	19.36111	Alluvial	Al_2O_3 19%, SiO_2 61%
278	Au	Xiangkhouang	Sop So	103.18720	19.35000	alluvial	
279	Au	Xiangkhouang	Houay Kham	103.24140	19.35000	alluvial	
280	Fe	Xiangkhouang	Xieng Khoang	103.40420	19.33750		hydrogoethite
281	Au	Xiangkhouang	Muang Khame	103.31310	19.32306	alluvial	old working
282	Sn	Louangphrabang	Houay Hip	101.83440	19.30861	geochemical anomaly	2400 ppm Sn, cassiterite also present
283	Au	Xiangkhouang	Muang Ngon	103.70000	19.21667	alluvial	Quaternary
284	Au	Xiangkhouang	Muang Ngan	103.70030	19.19695	alluvial	
285	Gypsum	Khammmouan	Xebangfai	105.02833	17.17694	Evaporite	$CaSO_4 2H_2O$ 93%
286	Pb, Zn	Vientiane	Kaiso	102.35000	19.16667	hydrothermal	
287	Barite (Pb, Zn)	Vientiane	Pha Luong	102.40000	19.16667		
288	Au	Xiangkhouang	Ban Kao	103.33333	19.16667	alluvial	Quaternary
289	Au	Xiangkhouang	Vong Pong	103.29530	19.16083	alluvial	
290	Zn	Vientiane	M. Vangvieng	102.34972	19.15861	epigenetic	Kaiso zinc deposit, Oxidized zinc (hydrozincite, smithonite), Primary: spharelite, galena ,Epigenetic deposit after skarr
291	Pb, Zn	Vientiane	Pha Koy	102.16667	19.15000	hydrothermal	
292	Pb, Zn (Ag)	Vientiane	Pha Luong	102.41667	19.15000	hydrothermal	
293	Zn	Vientiane	M. Vangviang	102.42500	19.11889	Mississippi valley	Pha Luang lead-zinc prospect, Lead and zinc oxide minerals, Cerussite, smithonite, Spharelite and galena
294	Au	Xiangkhouang	Ban Kao	103.34000	19.11611	alluvial	
295	Pb (Ag)	Vientiane	Pha Vansan	101.86667	19.10000	hydrothermal	
296	Mn	Xiangkhouang	Ban Pha Hai	103.05190	19.07111	residual	
297	Mo	Vientiane	Vientiane	102.31670	19.06667		
298	Pb (Ag)	Vientiane	Nam Chong	102.80000	19.06667	hydrothermal	
299	Au	Vientiane	Ban Longmon	103.03333	19.05000		
300	Mo	Xiangkhouang	Pa Hia (Ban Namthong)	103.28330	19.05000	hydrothermal	<2% Mo in the ore, associated with Cu, Pb, Zn, As

Appendix 2 Inventory of Mineral Deposits and Resources of Laos (6)

No.	MINERAL	PROVINCE	DISTRICT	LONGITUDE	LATITUDE	TYPE	NOTES
301	Au	Xiangkhouang	Ban Longmon	102.97080	19.03500	alluvial	
302	Au	Xiangkhouang	Ban Long Mon	102.97110	19.03500	alluvial	
303	Fe	Vientiane	Pha Lek	103.01667	19.01667	metasomatic	
304	Fe	Houaphan	M. Viengxay	103.01667	19.01667	skarn	Pha Lek deposit,hematite-magnetite,Skarn
305	Pb	Vientiane	Ban Bouakmou	102.30000	19.00000		
306	Cu (Sn)	Vientiane	Ban Namthong	103.25000	19.00000	skarn	
307	Au	Xiangkhouang	Nam Khamnoi, (That Kham)	103.60000	19.00000		
308	Mn	Vientiane	Ban Xam Khang	102.80560	18.99028		Mn 18%, Fe 12%, Si 26%
309	Fe	Xiangkhouang	Phalek	102.95310	18.99000	metasomatic	magnetite; permo-triassic age in Devonian-carboniferous shales
310	Au	Xiangkhouang	Muang Nhian	103.75420	18.98083	alluvial	
311	Pb	Vientiane	Boseun	101.91670	18.96667		
312	Sb	Vientiane	Bokeo	101.86667	18.95000		
313	Cu (Ag)	Vientiane	Pha Then	102.40000	18.95000	hydrothermal	
314	Au	Xiangkhouang	Pha Saman	103.74500	18.94500	alluvial	Quaternary; previously worked.
315	Cu	Xaignabouri	Ban Viangxai	101.48333	18.91667	hydrothermal	
316	Fe (Pb, Zn)	Vientiane	Nakangpa	102.00000	18.91667		
317	Au	Vientiane	Nam Met	101.98330	18.90000	alluvial	
318	Limestone	Vientiane	Vang Vieng	102.38330	18.90000	sedimentary rock	Late Paleozoic; presently worked
319	Halite	Vientiane	Vang Vieng	102.40000	18.90000	sedimentary rock	
320	Sn	Vientiane	Phuphadeng	103.04110	18.89167		
321	Clay	Vientiane	Vangvieng	102.14222	18.88389	Alluvial	Al_2O_3 17%
322	Limestone	Vientiane	BanDone	102.14222	18.88389	Stratiform	CaO 54%, MgO 0.5%, SO2 0.84%
323	Limestone	Vientiane	Vangvieng	102.03333	18.88333	Stratiform	CaO 55%, MgO 0.5%, SO2 0.3%
324	Sb	Vientiane	Ban Xon	102.78333	18.88333		
325	Clay	Vientiane	Vangvieng	102.46806	18.87667	Alluvial	Al_2O_3 18%
326	Au	Xaisomboun	Special Zone Xaisomboun	102.91139	18.87667	hydrothermal	Phu Kham prospect (Oxide resource), Phu Bia gold deposit, Oxide gold cap mineralization
327	Cu	Xaisomboun	Special Zone Xaisomboun	102.91139	18.87667	porphyry copper	Phu Kham copper deposit
328	Au	Borikhamxai	Nam Kham Nai	103.61030	18.86667	alluvial	old working
329	Au	Borikhamxai	Pha Sanom	103.75000	18.86667	alluvial	Quaternary
330	Au	Borikhamxai	Hat Kham	103.79030	18.86389	alluvial	old working
331	Coal	Vientiane	Vangvieng	102.28972	18.84139		Q>4,000 kcal/kg
332	Coal	Vientiane	Vangvieng	102.47417	18.82306		Q = 4,089 - 6,944kcal/kg; Ash = 15.8 - 40.1 %,S=0.7-0.25%; water = 6.5 - 13 %
333	Coal	Vientiane	Vangkhi	102.36670	18.81667	coal	Late Paleozoic
334	Coal	Vientiane	BanVangkhi	102.36667	18.81667		Q =5,584 to 5,638 KCal/Kg
335	Sn	Vientiane	Phu Phadeng	103.16667	18.75000		
336	Granite	Borikhamxai	Ban Phila	104.90000	18.73333	metamorphic?	
337	Limestone	Vientiane	Bandon	102.11670	18.68333	sedimentary rock	Late Paleozoic
338	Halite	Vientiane	Bandon	102.11670	18.68333	sedimentary rock	
339	Sis	Borikhamxai	Nam Gnala	104.88333	18.68333	hydrothermal (?)	
340	Cu (Sn)	Vientiane	Phu Huat	102.83333	18.66667	stratiform?	Early Mesozoic
341	Limestone	Vientiane	Pha Hoi	102.02920	18.66111	sedimentary rock	51.9% CaO
342	Coal	Vientiane	Bochan	102.18333	18.65000	coal	Late Paleozoic, present working
343	Mn	Vientiane	Hin Hop Khoang	102.28330	18.64167	heavy mineral	324 grains
344	Coal	Vientiane	NamLik	102.21056	18.64139		Q = 8,044 to 8,367 KCal/Kg; Avg= 8,150 KCal/Kg, Ash= 6.9% -28.30.50%; Avg= 21%., S = 0.94% to 1.34%; Avg= 1.05%., Water= 3.6% to 40.8%; Avg= 21.5%.
345	Pb (Zn)	Vientiane	Nathoun	102.01667	18.63333	hydrothermal	
346	Au	Vientiane	Houaykangxang	102.20000	18.63333	alluvial	Quaternary
347	Pb	Borikhamxai	Sopso	104.46670	18.61667		
348	Au	Vientiane	Kihn Ho	102.41670	18.60000	alluvial	Quaternary
349	Cu (Sn)	Vientiane	Phu Huat	102.80000	18.60000	stratiform?	Early Mesozoic
350	Au	Vientiane	Vang Kinh Ho	102.54810	18.58500	alluvial	
351	Au	Borikhamxai	Houay Sang Ngoi	104.75330	18.58500	alluvial	old working exploited by the Thais
352	Au	Vientiane	Houay La	102.10000	18.58333	alluvial	Quaternary
353	Barite	Vientiane	Pheuang	101.98833	18.57861		Ba 81-91%
354	Barite	Vientiane	Nalang	102.00000	18.56667	vein in acid volcanic	estimated reserves over 240,000 tons, 2.2 - 4.5 m thick & 360 m long. BaSO4 94.5 - 98.8% S.G. 4.2 -
355	Limestone	Vientiane	Nam Ngum	102.70000	18.56667	sedimentary rock	Late Paleozoic; presently worked
356	Coal	Vientiane	Bochan	102.14310	18.54000	stratiform	Anthracite; ash 10-38%, volatiles 6-9%, carbon 52-82%; presently worked
357	Au	Vientiane	Nam Thom	102.23330	18.51667	alluvial	
358	Au	Vientiane	Ban Thalat	102.51110	18.51667	alluvial	Quaternary; 0.35g/m3, estimated reserve 2Kg

Appendix 2 Inventory of Mineral Deposits and Resources of Laos (7)

No.	MINERAL	PROVINCE	DISTRICT	LONGITUDE	LATITUDE	TYPE	NOTES
359	Au	Vientiane	Na Kham	102.03330	18.50222	alluvial	
360	Sn	Vientiane	Ban Mon	102.29110	18.50000		
361	Halite	Borikhamxai	Ban Naham	103.66667	18.50000	evaporite	Late Mesozoic; present working
362	Halite	Borikhamxai	Ban Naham	103.66670	18.50000	evaporite	Late Mesozoic; presently worked
363	Au	Borikhamxai	Hatkham	103.65000	18.48333	alluvial	Quaternary
364	Au	Borikhamxai	Ban Phonkham	103.66670	18.46667	alluvial	Quaternary
365	Au, Sn	Borikhamxai	Nam Pan	105.00000	18.46667	hydrothermal, alluv	
366	Limestone	Vientiane	Muongliep	101.65000	18.45000	sedimentary rock	Late Paleozoic
367	Mn	Vientiane	Phong Hong	102.35000	18.45000	heavy mineral	
368	Au	Borikhamxai	Houaysangoy	104.80000	18.45000	alluvial	Quaternary
369	Au (Sn)	Borikhamxai	Sop Chat	104.88333	18.45000	alluvial	Quaternary
370	Coal	Vientiane	NamThom	102.20000	18.43333		Q=5,584 - 5,638 kcal/kg,Ash=32.58 - 34.8 %
371	Coal	Vientiane	Namthom	102.20000	18.43333	coal	Late Paleozoic
372	Au	Vientiane	Na Sang Khoang	102.36670	18.43333	alluvial	
373	Au	Bolikhamxay	M. Pakkading	104.04778	18.40306	alluvial	Ban Pak Sum deposit,native gold,Alluvial gold
374	Au	Vientiane	Nam Sang	102.06190	18.36889	alluvial	Quaternary
375	Gypsum	Vientiane	Thoulakhom	102.60000	18.36667	evaporite	Late Mesozoic
376	Pb	Borikhamxai	Pha Kachan	104.70000	18.36667	hydrothermal	previously worked
377	Au	Vientiane	Vieng Kham	102.41670	18.36250	alluvial	
378	Au	Borikhamxai	Nam Kading	103.98810	18.36000	alluvial	previous workings.
379	Halite	Vientiane	Ban Bo	102.58330	18.35000	evaporite	Late Mesozoic
380	Mn	Vientiane	Phou Pha Nang	102.25000	18.34028		
381	Coal	Vientiane	NamSang	102.10000	18.33333		Q= 7,430 kcal/kg
382	Au	Vientiane	Nam Sang	102.10000	18.33333	alluvial	Quaternary
383	Sn	Vientiane	Linh Xan	102.53330	18.33333	heavy mineral	15.69 gm/m3
384	Au	Vientiane	Huoi Cuoi	102.09170	18.32222	alluvial	
385	Clay	Bolikhamxay	Kamkeut	105.03333	18.31917	Alluvial	
386	Clay	VientianeMunic	Saythani	102.57500	18.30833	Alluvial	
387	Au	Bolikhamxay	M. Khamkeut	104.93333	18.30806	alluvial	Nam Ke - Nam Pheo alluvial gold deposit, native gold, chalcopyrite, spharelite, pyrite, arsenopyrite
388	Kaolinite	Vientiane	Hat Ma La	102.57500	18.30417	epithermal	
389	Mn	Vientiane	Nam Sang	102.15830	18.30000	heavy mineral	
390	Coal	Vientiane	Nam Sang	102.05310	18.29694	anthracite	Late Paleozoic; vertical seam 1-1.5m; ash 23%, volatiles 4-5%, carbon 70-72% (Saurin 1954)
391	Halite	Xaignabouri	Bo Bia	101.23390	18.27889	evaporite	
392	Coal	Vientiane	Nam Sang	102.15000	18.26667	coal	Late Paleozoic
393	Au	Vientiane	M. Sanakham	101.57917	18.26389	hydrothermal	Pounlak gold pospect,,Skarn
394	Au	Borikhamxai	Kham Keut	104.71670	18.25000	alluvial	Quaternary
395	Sn	Borikhamxai	Ban Nape	105.03330	18.25000	alluvial	Quaternary
396	Au (Sn)	Vientiane	Phia Lat	102.23333	18.23333	volcanic	Permian - Triassic
397	Pb	Borikhamxai	Phou Hai	104.51670	18.23333	hydrothermal	
398	Potash-Halite	Vientiane	Thagone	102.79639	18.22722	Evaporite	KCl 15-19%, Av 15%,MgCl2 10-28%, Av 19%
399	Au	Xaignabouri	Pak Lay	101.40670	18.22222	hydrothermal	
400	Sn	Borikhamxai	Lak Sao	104.95000	18.21667	alluvial	Quaternary
401	Au	Vientiane	Nam Khouan	101.63330	18.20000	alluvial	Quaternary
402	Au	Borikhamxai	Nam Pheo	105.13330	18.20000	metasomatic?	
403	Au	Vientiane	Na Kha	102.48330	18.19861	alluvial	
404	Kaolinite	Vientiane	Nong Dao	102.81940	18.19445	epithermal	
405	Sis	Borikhamxai	Akthon	104.18333	18.18333	hydrothermal	
406	Au	Borikhamxai	Nam Kato	105.29310	18.18000	alluvial	
407	Sis	Vientiane	Ylai	102.50000	18.16667	alluvial	Quaternary, present working
408	Au, Sn	Borikhamxai	Ban Nakadok	105.15000	18.16667	alluvial	Quaternary, present working
409	Fe	Vientiane	Ang Nai	102.18750	18.15417		
410	Au	Vientiane	M. Sangthong	102.23611	18.15111	hydrothermal	Sakay gold deposit, Pyrite, galena, spharelite ,Quartz vein
411	Gypsum	VientianeMunicipality	B.Veunkham	102.63472	18.13972	Evaporite	$CaSO_4 2H_2O$ 95-99%
412	Barite	Vientiane	Phoung	101.73889	18.13417		Ba 67%
413	Au	Vientiane	Nam Tiane	101.84640	18.13333	alluvial	old working
414	Au	Vientiane	Pac Ton	102.26110	18.12500	alluvial	
415	Au	Bolikhamxay	M. Khamkeut	105.13222	18.10417	alluvial	Nakadok alluvial gold deposit, native gold, chalcopyrite ,Occuring in unconsolidated sediments in the river basin
416	Clay	VientianeMunic	Saythani	102.90556	18.06667	Alluvial	

Appendix 2 Inventory of Mineral Deposits and Resources of Laos (8)

No.	MINERAL	PROVINCE	DISTRICT	LONGITUDE	LATITUDE	TYPE	NOTES
417	Clay	VientianeMunic	Saythani	102.76250	18.06111	Alluvial	
418	Cr	Xaignabouri	Nam Leng	101.32360	18.05972	geochemical anomaly	1300 ppm Cr
419	Au	Xaignabouri	Pak Leng	101.41670	18.05000	hydrothermal	limonitized quartz veins similar to Don Men (<134 g/t)
420	Glass sand	Vientiane	BanYlay	102.03333	18.01583	Alluvial	SiO_2 98%
421	Sn	Vientiane	Nam La	101.45700	18.00000	geochemical anomaly	Sn 2500 ppm
422	Au	Vientiane	Ban Pak Tiane	102.41330	18.00000	alluvial	In the Mekong near the Nam Tiane confluence
423	Kaolinite	Vientiane	Vientiane Plain	102.66667	18.00000	evaporite	Late Mesozoic
424	Halite	Vientiane	Plain	102.66670	18.00000	evaporite	Late Mesozoic; presently worked
425	Clay	Vientiane	BanDoung	102.72361	17.99028	Alluvial	Al_2O_3 17%, SiO_2 72%
426	Au	Vientiane	Ban Hom	102.45000	17.98333	alluvial	
427	Fe	Borikhamxai	Ban Nonglok	104.56670	17.98333	skarn	estimated reserve 5 million ton (Baniczky)
428	Au	Vientiane	Wat Tai	102.47190	17.98000	alluvial	
429	Halite	Vientiane	Ban Dung	102.70000	17.97500	sedimentary rock	
430	Granite	Vientiane	Sanakham	101.66667	17.96667		
431	Sn	Borikhamxai	Nongsun	104.50000	17.96667	residual	Quaternary laterite; presently worked
432	Sn	Borikhamxai	Ban Boneng	104.61670	17.96667	residual	Quaternary laterite; old working
433	Sn	Khammouan	M. Hinboun	104.58694	17.96111	hydrothermal	Bo Neng tin deposit (Phou Khoune tin deposit), cassiterite, pyrite, chalcopyrite
434	Clay	Vientiane	MuongThulakhom	102.60833	17.95833	Alluvial	Al_2O_3 16%, SiO_2 70%
435	Au	Vientiane	Ban Hat Kham	102.74640	17.95500	alluvial	2 gr/m3; old working
436	Sn	Khammouan	M. Nongxun-Thongkham	104.52639	17.95278	alluvial	Nong Xun tin deposit, cassiterite, stannite, arsenopyrite , Alluvial deposit originated from vein, stockwork
437	Au	Vientiane	Sanakham-I	101.66667	17.93333	alluvial; stockwork	present working
438	Au	Vientiane	Sanakham-1	101.66670	17.93333	hydrothermal	presently worked
439	Sn	Borikhamxai	Ban Thana	104.46670	17.93333	alluvial	Quaternary
440	Halite	Khammouan	Nakay	105.10000	17.93333	evaporite	Late Mesozoic
441	Clay	Vientiane	BanNonpapao	102.57361	17.93056	Alluvial	
442	Halite	Vientiane	Nong Heo	102.66670	17.93000	sedimentary rock	presently worked
443	Mn	Vientiane	Ban Pakmi (east of)	101.71250	17.92639	geochemical anomaly	4000ppm Mn
444	Sn	Vientiane	Ban Phak (east of)	101.42360	17.91945	geochemical anomaly	Sn 500 ppm
445	Au (Sn)	Xaignabouri	Don Men	101.38333	17.91667	hydrothermal	
446	Au	Vientiane	Houay King	101.48330	17.91667	alluvial	Quaternary; 0.5g/m3, estimated 60 kg reserve (Banthay)
447	Au	Vientiane	Sanakham-2	101.66670	17.91667	alluvial	Quaternary; presently worked
448	Clay	Vientiane	Vientiane	102.66667	17.91667		present working
449	Clay	Vientiane	BanXiengda	102.65694	17.90972	Alluvial	Al_2O_3 16%, SiO_2 67%
450	Sn	Khammouan	Ban Phontiou	104.61670	17.90000	residual	presently worked
451	Clay	Vientiane	BanMakNao	102.68333	17.89167	Alluvial	
452	Au	Vientiane	Tha Dua	102.71250	17.88333	alluvial	
453	Sn	Khammouan	M. Hinboun	104.60139	17.88194	hydrothermal	Phon Tiou tin deposit, cassiterite, Quartz vein, stockwork
454	Au	Khammouan	Ban Ta Coua	104.44690	17.87389	hydrothermal	co-ord from atlas to Repertoire
455	Au	Vientiane	M. Sanakham	101.51111	17.84444	alluvial	Houel Khing deposit,native gold,Alluvial gold
456	Au	Vientiane	Sanakham-II	101.66667	17.83333	alluvial	Quaternary
457	Halite	Xaignabouri	Nam Dane	101.11670	17.81667	evaporite	
458	Cu	Khammouan	Ban Bo	105.45000	17.80000		
459	Au	Khammouan	Phou Vang	105.58330	17.80000	hydrothermal?	
460	Halite	Khammouan	Ban Boune Fai	104.96000	17.79306	evaporite	
461	Au	Khammouan	Thong Ac	105.47330	17.77500	alluvial	old Chinese working
462	Halite	Khammouan	Nakay	104.96950	17.69389	evaporite	Late Mesozoic
463	Halite	Xaignabouri	Botene	101.18330	17.66667	evaporite	presently worked
464	Fe	Khammouan	M. Hinboun	105.41528	17.59278	hydrothermal	Ban Boneng iron deposit, hematite, limonite ,Hydrothermal
465	Phosphorite	Khammouan	Thakhek	104.74028	17.59028	Precipitation	P_2O_5 5-9%, Av 7.5%
466	Phosphorite	Khammouan	Phontiou	104.55278	17.90194	Precipitation	P_2O_5 8-22%, Av 7.5%
467	Phosphorite	Khammouan	Thakhek	104.83111	17.50194	Precipitation	P_2O_5 7-32%, Av 12%
468	Phosphorite	Khammouan	Thakhek	104.84583	17.46944	Precipitation	P_2O_5 8-26%, Av 13.5%
469	Limestone	Xiengkhouang	Khoune	105.00417	17.46944	Stratiform	CaO 51%, MgO 0.7%, SO_2 2.4%
470	Fe	Khammouan	Ban Na Kok	105.10000	17.45833	alluvial	1 kg/3 kg ore; locally worked
471	Limestone	Khammouan	Ban Dong	104.91670	17.45000	sedimentary rock	Late Paleozoic; presently worked
472	Dolomite	Khammouan	Ban Dong	104.96667	17.43333	sedimentary rock	Late Paleozoic
473	Phosphorite	Khammouan	Thakhek	104.86528	17.42917	Precipitation	P_2O_5 4-26%, Av 16%
474	Halite	Khammouan	Ban Song Kone	104.78000	17.41500	evaporite	locally worked

Appendix 2 Inventory of Mineral Deposits and Resources of Laos (9)

No.	MINERAL	PROVINCE	DISTRICT	LONGITUDE	LATITUDE	TYPE	NOTES
475	Potash-Halite	Khammouan	Thakhek	104.80833	17.33333		KCl 17.5%, $MgCl_2$ 13%
476	Halite	Khammouan	Thakhek	104.88330	17.33333	evaporite	Late Mesozoic; presently worked
477	Halite	Khammouan	Ban Nangkom	104.83330	17.28333	evaporite	
478	Phosphorite	Khammouan	Boualapha	105.03333	17.27222	Precipitation	P_2O_5 6-19%, Av 14%
479	Gypsum	Khammouan	Ban Tung	105.03333	17.21667	evaporite	Middle Mesozoic, present working
480	Coal	Khammouan	Poung Bone	105.85000	17.21667	coal	Late Paleozoic
481	Coal	Khammouan	Boulapha	105.85972	17.20139		Q= 8,400 kcal/kg
482	Pb	Savannakhet	Tchepone	105.91670	17.03333	hydrothermal	
483	Phosphorite	Khammouan	Hinboun	104.42778	18.02222	Precipitation	P_2O_5 7-34%
484	Potash-Halite	Khammouan	Nongbak	104.74528	17.00472		KCl 19%, $MgCl_2$ 16%,NaCl 52%
485	Au	Savannakhet	Moung Angkham	106.03330	16.96667	alluvial	presently worked
486	Cu	Savannakhet	M. Vilalouly	106.02500	16.96389	skarn, porphyry copper	Sepon, Khanong copper deposit , Chalcocite, chalcopyrite , Skarn, carbonate replacement
487	Fe	Vientiane	M. Met	106.02528	16.96389	hydrothermal	Hinheup-Kasi deposit, hematite, magnetite ,
488	Au	Savannakhet	M. Vilalouly	106.00833	16.95556	hydrothermal	Sepon gold deposit,Electrum, carline type, calcareous shale hosted
489	Au	Savannakhet	Ban Segui	106.04030	16.87500	alluvial	
490	Au	Savannakhet	Muang Van	106.04920	16.86583	alluvial	Sand of the Sa Segui
491	Coal	Savannakhet	Xom Ka Ret	106.23830	16.84806		
492	Au	Savannakhet	Houay Yeng	105.62640	16.83000	alluvial	local working
493	Au	Savannakhet	Nam Kok	105.89610	16.79389	alluvial	
494	Au	Savannakhet	Houay Min	106.07640	16.76695	alluvial	2-3 gr Au/tonne up to 25 gr Au/tonne
495	Fe	Savannakhet	Muang Van	105.97390	16.74889		small local working
496	Au	Savannakhet	Sethamouak	105.90000	16.71667	alluvial	Quaternary
497	Au	Savannakhet	Sethamouak	105.90000	16.71667	alluvial	Quaternary
498	Au	Savannakhet	Xieng Hom	106.11950	16.71667	alluvial	local working
499	Au	Savannakhet	Houay Kassang	105.94140	16.68583	alluvial	local working, river west of Phou La Loi
500	Au	Savannakhet	Muong San	106.01667	16.68333	alluvial	Quaternary
501	Sn	Savannakhet	Muang San	106.01670	16.68333	alluvial	Quaternary
502	Pb	Savannakhet	Nai Fa	106.45000	16.66667		
503	Gypsum	Savannakhet	Dong Hen	105.25000	16.63333	evaporite	Late Mesozoic; present working
504	Gypsum	Savannakhet	Champhone	105.23944	16.62778	Evaporite	$CaSO_4 2H_2O$ 92-98%, Av 95,7%
505	Cu	Savannakhet	Houei Hok	106.08333	16.58333		
506	Halite	Savannakhet	Keng Kok	105.18333	16.50000	evaporite	Late Mesozoic
507	Gypsum	Savannakhet	Keng Kok	105.18333	16.50000	evaporite	Late Mesozoic
508	Ha	Savannakhet	Ban Sin	104.80690	16.47889	evaporite	
509	Technetium	Savannakhet	Muong Nong	106.50000	16.40000	tactite	Neogene - Quaternary
510	Sn	Saravan	Ban Siou	106.88330	16.08333	igneous plutonic	related to a granite intrusive
511	Coal	Saravan	Chakeui	106.39472	16.05694		Q= 6,610 to 8,305 KCal/Kg; Avg= 7,450 KCal/Kg.,Ash= 24.81% -39.80%; Avg= 31.5%.,S = 0.24% to 0.59%; Avg= 0.41%., Water= 2.8% to 8.5%; Avg= 4.8%.
512	Limestone	Salavan	TaOi	106.39028	15.90750	Stratiform	CaO 44-52%
513	Coal	Saravan	Ban Padou	106.43330	15.90000	sedimentary rock	Anthracite; volatiles 6-16%, ash 10-38%, carbon 53-70%
514	Pb	Saravan	Ban Bac	106.80080	15.85806		little importance, unexploited
515	Fe	Saravan	Ban Pildeng	106.92190	15.85806		abandoned local working
516	Coal	Saravan	Houay Mun	106.56670	15.85000	coal	Late Paleozoic
517	Coal	Saravan	Cha Keui	106.73330	15.73333	sedimentary rock	Anthracite; volatiles 7-8%, ash 22%, carbon 69%
518	Au	Xekong	Ban Kaleum	106.75000	15.73333		
519	Pb	Saravan	Phou Sati	105.71670	15.68333		
520	Cu	Saravan	Khamthong	105.83333	15.53333		
521	Au	Xekong	Dakchung	107.25000	15.46667		
522	Sn	Xekong	Xekong Phu	106.76667	15.28333	alluvial	Quaternary
523	Cu (Au, Ag)	Xekong	Houei Vi	106.95000	15.21667	stratiform	Early Mesozoic
524	Al	Xekong	Muong Sanxay	107.15000	15.21667	residual	Neogene - Quaternary
525	Cu	Champasak	Ban Doung	106.01667	15.20000		
526	Sn	Xekong	Xekong Phou	106.83170	15.19167	alluvial	Quaternary
527	Gem (Topaz, Zircon	Champasak	Phu Nakhang	105.85000	15.18333	alluvial	Quaternary
528	Pb (Zn)	Xekong	Xekong	106.78333	15.18333		
529	Al	Champasak	Ban Namthang	106.13333	15.15000	residual	Neogene - Quaternary
530	Art (Amber)	Champasak	Champasak	105.93333	15.10000		
531	Au	Xekong	Nong Ta	107.43330	15.10000	alluvial	Quaternary

Appendix 2 Inventory of Mineral Deposits and Resources of Laos (10)

No.	MINERAL	PROVINCE	DISTRICT	LONGITUDE	LATITUDE	TYPE	NOTES
532	Cu (Ag)	Attapu	Houei Po	106.88333	15.08333	stratiform	Early Mesozoic
533	Gem (Zircon)	Champasak	Phu Champasak	105.80000	14.91667	alluvial	Quaternary
534	Au	Attapu	Pou Satieng	107.02110	14.89500	alluvial	
535	Au	Attapu	Attapu	106.76667	14.88333	alluvial	Quaternary
536	Cu (Au, Ag)	Attapu	Houei Takdet	106.03333	14.86667	stratiform	Early Mesozoic, old working
537	Au	Attapu	Houay Tabos	107.12890	14.85889	hydrothermal	
538	Au	Attapu	Se Sou	107.08330	14.83333	alluvial	Quaternary
539	Au	Attapu	Attapu	106.88330	14.80000	alluvial	Quaternary
540	Cu	Attapu	Me Sang	106.48333	14.76667		
541	Cu	Champasak	Phu Kao	105.83333	14.75000		
542	Pb	Champasak	Phou Tay	105.98890	14.75000	hydrothermal	
543	Pb	Attapu	Phou Tapak	106.55000	14.73333	hydrothermal	
544	Pb	Attapu	Mai Phai	106.46310	14.73306		local working
545	Cu, (Ag, Au)	Attapu	Sepian	106.48333	14.71667	stratiform	Early Mesozoic
546	Au	Attapu	Ban Pa Kha	107.27310	14.71500	hydrothermal	
547	Au	Attapu	Ban Het	107.49810	14.70611	alluvial	
548	Cu, (Ag, Au)	Attapu	Sekong	106.70000	14.70000	stratiform	Early Mesozoic, old working
549	Au	Attapu	Ban Tassieng	107.37200	14.69694	hydrothermal	
550	Pb	Champasak	Phou Moi	105.97970	14.68889	hydrothermal	galena, chalcopyrite, barite in qtz veins in rhyolite
551	Halite	Champasak	Khampho	106.17500	14.68833	evaporite	presently worked; amended location from Gisements Atlas
552	Pb	Champasak	Houei Phana	105.75000	14.66667		
553	Au	Attapu	Nam Panang	107.35000	14.66667	alluvial	Quaternary
554	Ag, Au	Champasak	Phu Takouan	105.90000	14.65000	volcanic?	
555	Pb	Champasak	Houay Phana	105.71610	14.63417		
556	Pb	Champasak	Houay Ban	105.71610	14.63389		
557	Cu	Champasak	Houei Phai	105.75000	14.63333	stratiform	Early Mesozoic
558	Cu	Champasak	Chong Ang	106.16667	14.63333		
559	Kaolinite	Champasak	Khampho	106.28330	14.63333	epithermal	
560	Kaolinite	Champasak	Khampho	106.28333	14.63333		
561	Art (Pagodite)	Attapu	Phu Phangnong	107.03333	14.63333		
562	Pb	Champasak	Thao tan	105.96670	14.61945		
563	Pb	Champasak	Phy Moi	105.98333	14.61667	hydrothermal	
564	Pb	Champasak	Chong Ang	106.16667	14.61667		
565	Pb	Champasak	Chong Ang	106.16670	14.61667		
566	Art (Pagodite)	Attapu	Ban Khampho	106.36667	14.60000		
567	Art (Amber)	Attapu	Khampho	106.33333	14.55000		
568	Sn	Champasak	Phou Khoum	105.91670	14.53333		
569	Pb	Champasak	Thao Tan	105.95000	14.53333		
570	Halite	Champasak	Khampho	106.31667	14.50000		present working
571	Cu	Champasak	Nongkhoumthong	105.71667	14.43333	stratiform	Early Mesozoic
572	Gem (Amethyst)	Champasak	Muong Khong	105.91667	14.33333	alluvial	

Abbreviation

Ag : Silver, Al : Aluminum, Asb : Au : Gold, Cr : Chromium, Cu : Copper, Fe : Iron, Gem : Gemstone, Mg : Magnesium, Mn : Manganese, Mo : Molybdenum, Pb : Lead, Sb : Antimony, Sis : ?, Sn : Tin, Zn : Zinc

Appendix 3-1 Inventory of Ditailed Mietallic Deposits (1)

(1) Gold Deposits

Mineral type	No.	Name of deposit	Coordinate		Province, district	Scale	Ore reserves & resources (t)			Au Reserves & resources (Kg)			Grade	Minerals
			Latitude	Longitude			Reserves	Resources	Total	Reserves	Resources	Total		
1. Gold (Au)														
	1.1	Sepon gold deposit	16°57' **20"**	106°00' 30"	M. Vilalouly	Large	14,224,000	36,260,000	50,484,000	48,788	105,879	154,667	Au 3.06g/t	Electrum
					P. Savannakhet		14,224,000			48,788			Au 3.43g/t	
								36,260,000			105,879		Au 2.92g/t	
	1.2	Phu Bia gold deposit	18°52' 36"	102°54' 41"	P. Vientiane	Middle	16,480,000		16,480,000	16,944		16,944	Au 1.0 g/t	
		(Oxide resource)					11,820,000		11,820,000	12,045		12,045	cutoff 0.5g/t Au	
		Phu Kham prospect					6,870,000		6,870,000	6,870		6,870	Au 1.0 g/t	
		LCT					1,350,000		1,350,000	1,215		1,215	Au 0.9 g/t	
		Ban Houayxai					3,600,000		3,600,000	3,960		3,960	Au 1.1 g/t	
		(Primary deposit)					4,660,000		4,660,000	4,899		4,899	cutoff 0.5g/t Au	
		LCT					2,310,000		2,310,000	2,079		2,079	Au 0.9 g/t	
		Ban Houayxai					2,350,000		2,350,000	2,820		2,820	Au 1.2 g/t	
	1.3	Sakay gold deposit	18°09' 04"	102°14' 10"	M. Sangthong	Small	751,726		751,726	4,208		4,208	Au 9-22 g/t	Pyrite, galena, spharelite
					P. Vientiane									
	1.4	Pounlak gold pospect	18°15' 50"	101°34' 45"	M. Sanakham	Small		1,351,000	1,351,000		1,149	1,149	Au 0.85 g/t	
					P. Vientiane									
	1.5	Phapon gold deposit			M. PakOu	Small	855,497		855,497	2,109		2,109	Au 2.4 g/t	Electrum
			20°10' **24"**	102°23' 50"	P. Louanprabang									
Total							32,311,223	37,611,000	69,922,223	72,049	107,028	179,077		

Appendix 3-1 Inventory of Ditailed Metallic Deposits (2)

(1) Gold Deposits

Characteristic	Infrastructure		Status
	Road condition,distance from Vientiane	Power line condition	
Carline type calcarious shale hosted	720km from Vientiane It takes 10hrs.	Good condition	Prodcting by Lang Xang Minerals (Oxiana, Australia) at August 2003, homepage (cutoff 1.0g/t Au)
Oxide gold cap mineralization, gossan after primary porphry copper-gold and skarn type mineralization	225km from Vientiane. 145km of paved road was completed. 80km metalled road. It takes 6hrs.	Available	Developing by Phu Bia Mining (Pan Mekong Exploration) (Pan Australian Resources)
Quartz vein Reserves of Ag 9,925kg, Cu 54t, Zn 1029t, Pb 321t	45km to Sakay,metalled road It takes 1:30hrs	Good condition	Vientiane Trade Co. Ltd
Skarn	220km from Vientiane 185km metalled road It takes 5hrs.	Shorest way to power net is 20km.	Operating by Army
Quartz vein, Limestone, sandstone and clay z	450km from Vientiane 32km metalled road It takes 7hrs.	Shorest way to power net is 22km.	Explorating by Huajing Mining Co.(China)

Appendix 3-1 Inventory of Ditailed Metallic Deposits (3)

(2) Placer Gold Deposits

Mineral type	No.	Name of deposit	Coordinate		Province, district	Scale	Ore reserves & resources (t)			Au Reserves & resouces (Kg)			Grade
			Latitude	Longitude			Reserves	Resources	Total	Reserves	Resources	Total	
2. Placer Gold (Au)	2.1	Nakadok placer gold deposit	18°06' 15"	105°07' 56"	M. Khamkeut, P. Bolikhamxay	Small		-	-		123	123	Au 2-7 g/m^3
	2.2	Nam Ke - Nam Pheo placer gold deposit	18°18' 29"	104°56' 00"	M. Khamkeut, P. Bolikhamxay	Small	-		-	161		161	Au 0.5 g/m^3
	2.3	Ban Pak Sum deposit	18°24' **11"**	104°02' 52"	M. Pakkading, P. Bolikhamxay	Small	12,416,000		12,416,000	6,828		6,828	Au 0.5-0.8 g/t
	2.4	Houel Khing deposit	17°50' 40"	101°30' 40"	M. Sanakham, P. Vientiane	Small				49		49	Au 0.2-0.6 g/m^3
Total							12,416,000		12,416,000	7,038	123	7,161	

Appendix 3-1 Inventory of Ditailed Metallic Deposits (4)

(2) Placer Gold Deposits

Minerals	Characteristic	Infrastructure		Status
		Road condition,distance from Vientiane	Power line condition	
native gold, chalcopyrite	Occuring in unconsolidated sediments in the river basin 10 gold-bearing placer, 200-600m long, 20-70m wide	175km from Vientiane 150km paved road was completed 25km metalled road. It takes 4hrs.	Good condition	Operating by Army company
native gold, chalcopyrite sphalerite, pyrite, arsenopyrite	Origin: Hydrothermal quartz-sulfide vein, stockwork-type, Au 0.4-1.2g/t	170km from Vientiane 150km paved road was completed 20km metalled road. It takes 4hrs.	Good condition	Operating by Khamkeut Mining Ltd
native gold	Alluvial gold	185km from Vientiane 178km paved road was completed 7km metalled road. It takes 4hrs.	Shortest way to power net is 7km.	Operating by Boikhamxay Gold Mining J/V
native gold	Alluvial gold	227km from Vientiane 42km of paved road was completed 185km of metalled road. It takes 6hrs.	Shortest way to power net is 22km.	Operating by Dao Lao

Appendix 3-1 Inventory of Ditailed Metallic Deposits (5)

(3) Copper Deposits

Mineral type	No.	Name of deposit	Coordinate		Province, district	Scale	Ore reserevs & resources (t)			Copper Reserve +resources (t)			Grad
			Latitude	Longitude			Reserves	Resources	Total	Reserves	Resources	Total	
3. Copper (Cu)													
	3.1	Sepon			M. Vilalouly,	Large	15,500,000	95,310,000	110,810,000	812,000	1,984,000	2,796,000	Cu 2.5%
		Khanong copper deposit	16°57' 50"	106°01' 31"	P. Savannakhet		15,500,000			812,000			Cu 5.2%
								41,310,000			1,224,000		Cu 2.96
		Thengkham North copper deposit						29,000,000			435,000		Cu 1.5%
		Thengkham South copper deposit						25,000,000			325,000		Cu 1.3%
	3.2	Phu Kham copper deposit	18°52' 36"	102°54' 41"	P.Vientiane	Large	144,000,000	192,000,000	336,000,000	810,000	1,190,000	2,000,000	Cu 0.60
										(Au 36t)	(Au 46t)	(Au 82t)	(Au 0.24
							144,000,000			810,000			Cu 0.56
										(Au 36t)			(Au 0.25
								192,000,000			1,190,000		Cu 0.62
											(Au 46t)		(Au 0.24
	3.3	Ban Houei Mo copper deposit			M. Long,	Small	2,098,674	5,507,046	7,605,720	47,010	123,358	170,368	Cu 2.24
		(Yin Shui Shan Cu deposit)	21°00' 49"	100°57' 20"	P. Louangnamtha								
	3.4	Phu Taxan copper deposit	22°04' 50"	101°49' 35"	M. Yoth Ou,	Small	41,000		41,000	6,700		6,700	Cu 15%
		(Puda Cu-Pb-Zn deposit)			P. Phongsaly								
Total							161,639,674	292,817,046	454,456,720	1,675,710	3,297,358	4,973,068	

(4) Lead and Zinc Deposits

Mineral type	No.	Name of deposit	Coordinate		Province, district	Scale	Ore reserevs & resources (t)			Zinc Reserve & resources (t)			Grad
			Latitude	Longitude			Reserves	Resources	Total	Reserves	Resources	Total	
4. Zinc (Zn)	4.1	Kaiso zinc deposit	19°09' 31"	102°20' 59"	M. Vangvieng,	Small	23,000		23,000	8,510		8,510	Zn 37%
					P. Vientiane								
	4.2	Puda Cu-Pb-Zn deposit	22°04' 50"	101°49' 35"	M. Yuewu,	Small	62,820		62,820	4,200		4,200	Zn 7%
					P. Phongsali								Pb 12%
	4.3	Pha Luang lead-zinc prospect											Drill hol
			19°07' 08"	102°25' 30"	M. Vangvieng,								Pb+Zn
					P. Vientiane								8 -26%
Total							85,820		85,820	12,710		12,710	

Appendix 3-1 Inventory of Ditailed Metallic Deposits (6)

(3) Copper Deposits

Minerals	Characteristic	Infrastructure		Status
		Road condition, Distance from Vientiane	Power line condition	
Chalcocite, chalcopyrite Primary sulfide, oxide copper	Skarn, carbonate replacement Porphyry copper	720km from Vientiane to Sepon 680km paved road was completed 40km metalled road. It takes 10 hrs.	Good condition	Operating by Oxiana at Dec. 2003, homepage (cutoff 0.5% Cu)
	Porphyry copper	350km from Vientiane to Phubia 270km paved road was completed 80km metalled road. It takes 6 hrs.	Available net ligth power	F/S by Phu Bia Mining (cutoff Cu 0.3%)
Bornite, chalcopyrite chalcocite, magnetite	Vein type, controlled by NE direction quartz vein, sulfide dissemination	760km from Vientiane 720km paved road was completed 40km metalled road. It takes 2 days.	Good condition	F/S by Lao-China Oriental Mining Development Co.
-	Fracture zone with clay alteration	800km from Vientiane 780km paved road was completed 20km metalled road. It takes 2 days and 6hrs.	No trasmit electricity Diesel generator is needed.	Prospecting by Yuxxixuanglong Co (China)

(4) Lead and Zinc Deposits

Minerals	Characteristic	Infrastructure		Status
		Road condition, Distance from Vientiane	Power line condition	
Oxidised zinc (hydrozincite, smithonite)	Epigenetic deposit after skarn	180km from Vientiane 6km metalled road. It takes 3hrs.	Shortest way to power net is 6km	**Operating by Padaend Industry Co. (Thai)**
Primary: spharelite, galena	Fracture zone with clay alteration	820km from Vientiane. 12km metalled road. It takes 2days and 2hrs.	Shortest way to power net is 35km	**Prospecting by Laoyonzin Development Mineral (China)**
-	Mississippi Vally type carbonate hosted deposit	160km north of Vientiane		**Exploring by Rox Resources Limited (Australia)**
Lead and zinc oxide minerals Cerussite, smithsonite Spharelite and galena				

Appendix 3-1 Inventory of Ditailed Metallic Deposits (7)

(5) Tin Deposits

Mineral type	No.	Name of deposit	Coordinate		Province, district	Scale	Ore reserevs & resources (t)			Tin Reserve & resources (t)			Grade	Minerals
			Latitude	Longitude			Reserves	Resources	Total	Reserves	Resources	Total		
5. Tin (Sn)	5.1	Phon Tiou tin deposit	17°52' **55"**	104°36' 05"	M. Hinboun P. Khammouan	Middle	5,689,000 (0.19% Sn)	4,400,000 (0.32% Sn)	10,089,000	10,980	14,400	25,380	Sn 0.24%	Cassiterite
	5.2	Bo Neng tin deposit (Phou Khoune tin deposit)	17°57' **40"**	104°35' 13"	M. Hinboun P. Khammouan	Middle	2,389,000 (0.22% Sn)	2,729,000 (0.23% Sn)	5,118,000	5,279	6,300	11,579	Sn 0.23%	Cassiterite, pyrite, chalcopyr
	5.3	Nong Xun tin deposit	17°57' **10"**	104°31' 35"	M. Nongxun-Thongkham P. Khammouan	Small	28,967,758 542,000		28,967,758 542,000	2,914 784		2,914 784	Sn 171g/m^3 Sn 0.144%	Cassiterite Cassiterite, stanı arsenopyrite
		Total					37,587,758	7,129,000	44,716,758	19,957	20,700	40,657		

(6) Iron Deposits

Mineral type	No.	Name of deposit	Coordinate		Province, district	Scale	Ore reserevs & resources (t)			Grade	Minerals	Characteristic
			Latitude	Longitude			Reserves	Resources	Total			
6. Iron (Fe)	6.1	Phou Nhouan deposit	19°24' 34"	103°07' 46"	M. Khun P. Xiengkhouang	Middle	26,166,420		26,166,420	Fe 25-69%, (Av 47%)	hematite-magnetite	Skarn
	6.2	Pha Lek deposit	19°01' 00"	103°01' 00"	M. Viengxay P. Houaphan	Small		30,000,000	30,000,000	hematite-magnetite 47-74%	hematite-magnetite	Skarn
	6.3	Ban Mone deposit	19°37' 50"	103°14' 00"	M. Phek P. Xiengkhuang	Small		1,500,000	1,500,000	Fe 29-66%	magnetite 75-80%	Skarn
	6.4	Ban Boneng iron deposit	17°35' 34"	105°24' 55"	M. Hinboun P. Khammouan	Small		5,000,000	5,000,000	non	hematite, limonite	Hydrothermal
	6.5	Hinheup-Kasi deposit	16°57' 50"	106°01' 31"	M. Met P. Vientiane	Small		3,011,670	3,011,670	Fe 55%	hematite, magnetite	
		Total					26,166,420	39,511,670	65,678,090			

(7) Iron-sulfide Deposit

Mineral type	No.	Name of deposit	Coordinate		Province, district	Scale	Ore Reserves (t)	Grade	Minerals	Characteristic	Status
			Latitude	Longitude							
7. Iron sulfide	7.1	Marcasite- Pyrite	20°37' **40"**	104°09' 15"	Nadone, Houaphan	Small	474,781,000	marcasite 40-90% pyrite 1-7%	marcasite, pyrite	Hydrothermal	
		Total									

(8) Manganese Deposit

Mineral type	No.	Name of deposit	Coordinate		Province, district	Scale	Ore reserves (t)	Grade	Minerals	Characteristic	Status
			Latitude	Longitude							
8. Manganese	8.1	Ban Xaichaleun deposit	20°17' **10"**	100°29' 25"	Ban Xaichaleun P. Bokeo	Small	310,839	MnO 63%	Pyrolussite?	Skarn	F/S by Ban Xaichaleun
		Total					310,839				

Appendix 3-1 Inventory of Ditailed Metallic Deposits (8)

(5) Tin Deposits

Characteristic	Infrastructure		Status
	Road condition,distance from Vientiane	Power line condition	
Quartz vein, stockwork	300km from Vientiane. 26km metalled road. It takes 4hrs.	Good condition	Operating by JV w/ Korea PDR
Quartz vein, stockwork Fracture controlled NE-Sw Alluvial depsoit originated from vein, stockwork after greisenisation and pegmatisation Other 3 prospect of 3,700 t of Sn	306Km from Vientiane. 32km metalled road. It takes 4.5hrs.	Good condition	Exploring by Lao-Russian JV (Namicor)
Alluvial deposit originated from vein, stockwork	306Km from Vientiane. 32km metalled road. It takes 4.5hrs	Good condition	Nongxun Chaleun Phathana

(6) Iron Deposits

Infrastructure		Status
Road condition, Distance from Vientiane	Power line condition	
422km from Vientiane 22km metalled road. It takes 8 hrs.	Shortest way to power net is 22km.	Phuyouane
630km from Vientiane. 30km metalled road. It takes 2 days.	Shortest way to power net is 30km.	Comico
422km from Vientiane 20km metalled road. It takes 8 hrs.	Shortest way to power net is 20km.	
344km from Vientian. 309km, 309km paved road is completed. 35km metalled road. It takes 7 hrs.	Good condition	
180km from Vientiane 6km metalled road. It takes 4 hrs.	Shortest way to power net is 6km.	First pacific Mining Lao

Appendix 3-2 Inventry of Coal Deposits

Mineral type	No.	Name of deposit	Coordinate		District,Province	Scale	Ore reserves & resources (t)			Grade	Characteristic	Statu
			Latitude	Longitude			Reserves	Resources	Total			
1. Coal												
	1.1	Khangphaniang lignite depo	19° 30' 45"	103° 50' 50"	M. Nonghed, P. Xiengkhouang	**Small**		2,939,000	2,939,000	Q=6,133 to 6,537 KCal/Kg ; Avg=6,49 KCal/Kg,Ash=1.68 - 22.58 % ; Avg = 10.88 %,S= 0.5 - 2.35 % ; Avg = 1.45 %,Water= 10.45 - 21.47 % ; Avg = 16.50 %		
	1.2	Muong Phane lignite depos	19° 24' 29"	103° 25' 09"	M. Phane, P. Xiengkhouang	**Middle**	**591,000**	**9,737,883**	**10,328,883**	Q= 3,461 to 6,661 KCal/Kg; Avg= 5,190 KCal/Kg,Ash= 21.26% to 33.60%; Avg = 27.40%.,S = 1.2% to 5.09%; Avg = 2.45%., Water= 11.48% to 16.96%; Avg= 14.35%.		
	1.3	Hongsa lignite deposit	19° 39' 00"	101° 15' 00"	M. Hongsa, P. Sayaburi	**Large**	**511,025,339**		**511,025,339**	Q = 1,032 to 3,792 KCal/Kg; Avg= 2,493 KCal/kg Ash= 7.4% - 43.8%; Avg= 23.3% S= 0.3% to 2.6%; Avg= 0.75%. Water= 15% to 40%; Avg= 30.5%.		
	1.4	Viengphoukha lignite deposit	20° 38' 43"	101° 02' 00"	M. Ngeun, P. Luangnamtha	**Middle**		**10,974,240**	**10,974,240**	Q = 4,900 to 5,200 KCal/Kg; Avg= 5,000 KCal/Kg ,Ash= 10% - 15%; Avg= 12.5%.,S = 1.2% to 2.2%; Avg= 1.7%.		
	1.5	Ban Ai coal deposit	21° 03' 29"	101° 49' 30"	M. Namo, P. Oudomxay	**Small**		**2,000,000**	**2,000,000**	Q = 5,000 KCal/Kg; Ash = 48.6-63.1%,Moisture=9.4-9.9%		
	1.6	Ban Khouang lignite deposit	-	-	M. Namo, P. Oudomxay	**Small**		**115,450**	**115,450**			
	1.7	Ban Vangkhi anthracite deposit	18° 49' 00"	102° 22' 00"	Ban Vangkhi, P. Vientiane	**Small**		**400,000**	**400,000**	Q =5,584 to 5,638 KCal/Kg		
	1.8	Bo Chan anthracite deposit	18° 38' 29"	102° 12' 38"	Nam Lik, P. Vientiane	**Small**	**2,010,000**	**6,144,000**	**8,154,000**	Q = 8,044 to 8,367 KCal/Kg; Avg= 8,150 KCal/Kg, Ash= 6.9% -28.30.50%; Avg= 21%., S = 0.94% to 1.34%; Avg= 1.05%., Water= 3.6% to 40.8%; Avg= 21.5%.		
	1.9	Chakeui anthracite deposit	16° 03' 25"	106° 23' 41"	Chakeui, P. Saravan	**Middle**		**27,986,500**	**27,986,500**	Q= 6,610 to 8,305 KCal/Kg; Avg= 7,450 KCal/Kg.,Ash= 24.81% -39.80%; Avg= 31.5%.,S = 0.24% to 0.59%; Avg= 0.41%., Water= 2.8% to 8.5%; Avg= 4.8%.		
	1.10	Phongsaly coal deposit	21° 42' 00"	102° 06' 00"	Phongsaly area, P. Phongsaly	**Middle**		**24,500,000**	**24,500,000**	Q= 5,809 - 8,220 kcal/kg,Ash= 13.83 - 36.7 %		
	1.11	Pougbone coal deposit	17° 12' 05"	105° 51' 35"	M. Boulapha, P. Khammouan		-	-	-	Q= 8,400 kcal/kg		
	1.12	Nam Thom coal deposit	18° 26' 00"	102° 12' 00"	Nam Thom, P. Vientiane	**Small**		**400,000**	**400,000**	Q=5,584 - 5,638 kcal/kg,Ash=32.58 - 34.8 %		
	1.13	Nam Sang coal deposit	18° 20' 00"	102° 06' 00"	Nam Sang, P. Vientiane		-	-	-	Q= 7,430 kcal/kg		
	1.14	Vangmieng coal deposit	18° 49' 23"	102° 28' 27"	M. Vangvieng, P. Vientiane	**Small**	**2,115,000**	-	**2,115,000**	Q = 4,089 - 6,944kcal/kg; Ash = 15.8 - 40.1 %,S=0.7-0.25%; water = 6.5 - 13 %		
	1.15	Nam Geun coal deposit	-	-	M. Namo, P. Oudomxay	**Middle**		**12,727,356**	**12,727,356**	Q = 6,828kcal/kg; W =11.47%, A = 18.36%,V=49.18%		
	1.16	Mengkuaphong coal depos	22° 22' 15"	102° 00' 45"	M. Nhotou, P. Phongsaly	**Small**		**801,552**	**801,552**	Q = 4,247 - 7,680 kcal/kg		
	1.17	Hinheup coal deposit	18° 50' 29"	102° 17' 23"	M. Vangvieng, P. Vientiane	**Small**		**2,311,901**	**2,311,901**	Q>4,000 kcal/kg		
		Total					**515,741,339**	**101,037,882**	**616,779,221**			

Appendix 3-3 Inventory of Industrial Materials (1)

Mineral type	No.	Name of deposit	Coordinate		District,Province	Scale	Ore reserves & resources (t)		
			Latitude	Longitude			Reserves	Resources	Total
1. Gypsum									
	1.1	Khok Hin Keo deposit	16° 37' 40"	105° 14' 22"	M. Champhone, P. Savannakhet	Large	5,466,190	10,554,700	16,020,890
	1.2	Bounghouana - Tung gypsum deposit	17° 10' 37"	105° 01' 42"	M. Xebangfai, P. Khammmouan	Large	2,354,000	14,217,000	16,571,000
	1.3	Vientiane Plain deposit	18° 08' 23"	102° 38' 05"	B. Veunkham, Vientiane Municipality	Large		13,000,000	13,000,000
	1.4	Ban laomakkha deposit	–	–	M. Champhone, P. Savannakhet	Large		42,120,000	42,120,000
Total							7,820,190	79,891,700	87,711,890
2. Clay									
	2.1	Ban Doung deposit	17° 59' 25"	102° 43' 25"	Ban Doung, Vientiane	Middle		1,330,680	1,330,680
	2.2	Ban Xiengda deposit	17° 54' 35"	102° 39' 25"	BanXiengda, Vientiane	Small		223,200	232,200
	2.3	Ban Nonpapao deposit	17° 55' 50"	102° 34' 25"	Ban Nonpapao, Vientiane	Small		494,400	494,400
	2.4	Ban Thin kaoline deposit	17° 57' 30"	102° 36' 30"	Muong Thulakhom, Vientiane	Small		654,150	654,150
	2.5	Ban Mak Nao deposit	17° 53' 30"	102° 41' 00"	Ban Mak Nao, Vientiane	Small		253,000	253,000
	2.6	Ban Latbouak deposit	19° 53' 50"	102° 28' 00"	Ban Latbouak, M. Pek, XiengKhouang	Large		28,000,000	28,000,000
	2.7	Ban Ko	20° 26' 10"	104° 00' 38"	Ban Ko, P. Samneua	Small		278,000	278,000
	2.8	Houei Mi	20° 24' 00"	104° 02' 45"	Houei Mi, P. Samneua	Small		373,000	373,000
	2.9	Ban Nathong	20° 25' 05"	104° 03' 20"	Ban Nathong, P. Samneua	Small		119,000	119,000
	2.10	Muong Dong	20° 15' 45"	104° 03' 56"	Muong Dong, P. Samneua	Small		80,000	80,000
	2.11	Khangphaniang	19° 25' 51"	103° 25' 13"	Khangphaniang, p. Xiengkhoung	Small	44,224	72,222	116,446
	2.12	Lathouang deposit	19° 35' 00"	103° 14' 10"	Lathouang, P. Xiengkhoung	Large		20,250,000	20,250,000
	2.13	Dongdane deposit	19° 21' 40"	103° 16' 25"	Dongdane, P. Xiengkhoung	Middle		8,400,000	8,400,000
	2.14	Ban Nongheo	18° 18' 30"	102° 34' 30"	M. Saythani, Vientiane Munic	Small		714,000	714,000
	2.15	Khohsa	18° 04' 00"	102° 54' 20"	M. Saythani, Vientiane Munic	Small		900,000	900,000
	2.16	Km22	18° 03' 40"	102° 45' 45"	M. Saythani, Vientiane Munic	Small		626,560	626,560
	2.17	Ban Khanmak	18° 52' 36"	102° 28' 05"	M. Vangvieng, Vientiane	Middle	1,800,000	1,400,000	3,200,000
	2.18	Ban Done	18° 53' 02"	102° 08' 32"	M. Vangvieng, Vientiane	Middle	3,600,000	1,000,000	4,600,000
	2.19	Nahuang Ceramic deposit	18° 19' 09"	105° 02' 00"	M. Kamkeut, P. Bolikhamxay	Middle		4,475,000	4,475,000
Total							5,444,224	69,643,212	75,096,436

Appendix 3-3 Inventory of Industrial Materials (2)

Grade	Mineral	Characteristic	Status
$CaSO_4 2H_2O$ 92-98%, Av 95,7%	gypsum 95-99%	Evaporite	
$CaSO_4 2H_2O$ 93%		Evaporite	Operating
$CaSO_4 2H_2O$ 95-99%		Evaporite	
CaO 32-34%, SO_3 44-46%			
Al_2O_3 17%, SiO_2 72%		Alluvial	
Al_2O_3 16%, SiO_2 67%		Alluvial	
		Alluvial	
Al_2O_3 16%, SiO_2 70%		Alluvial	
		Alluvial	
Al_2O_3 18%, SiO_2 61%		Alluvial	
		Alluvial	
		Alluvial	
		Alluvial	
		Alluvial	
		Alluvial	
Al_2O_3 21%, SiO_2 55%		Alluvial	
Al_2O_3 19%, SiO_2 61%		Alluvial	
		Alluvial	
		Alluvial	
		Alluvial	
Al_2O_3 18%		Alluvial	
Al_2O_3 17%		Alluvial	
		Alluvial	

Appendix 3-3 Inventory of Industrial Materials (3)

3. Glass sand	3.1	Ban Ylai deposit	18° 00' 57"	102° 02' 00"	Ban Ylay, P. Vientiane	Middle	3,898,639	4090600	7,989,239
	Total						3,898,639	4090600	7,989,239
4. Potash-Halite	4.1	Thagone Potash salt	18° 13' 38"	102° 47' 47"	Thagone, P. Vientiane	Large		50,344 million	50,344 million
	4.2	Nonglom Potash salt	17° 00' 17"	104° 44' 43"	M. Nongbak, P. Khammouan	Large		139 million of potash	139 million of potash
								195 million of halite	195 million of halite
	4.3	Nahe Potash salt	17° 20' 00"	104° 48' 30"	M. Thakhek, P. Khmmouan	Large		26 million of potash	26 million of potash
								200 million of halite	200 million of halite
	Total							50,699 million of potash	50,699 million of potash
								395 million of halite	395 million of halite
5. Limestone	5.1	Tha Khiat Cement limestone	17° 28' 10"	105° 00' 15"	M. Khoune, P. Xiengkhouang	Large		75,000,000	75,000,000
	5.2	Khangphaniang limestone	19° 25' 51"	103° 25' 13"	Khangphaniang, P. Xiengkhouang	Small	70,860	92,540	163,400
	5.3	Ban Naleuang limestone			Moung Thulakhom, Vientiane	Middle	6,822,500		6,822,500
	5.4	Ban Khanmak limestone	18° 53' 00"	102° 02' 00"	M. Vangvieng, Vientiane	Large	5,500,000	38,200,000	43,700,000
	5.5	Ban Done limestone	18° 53' 02"	102° 08' 32"	Ban Done, Vientiane	Middle	1,211,000	5,145,000	6,356,000
	5.6	Ban Tham limestone	19° 23' 30"	103° 13' 35"	M. Khoune, P. Xiengkhouang	Large		100,000,000	100,000,000
	5.7	M. Liad limestone	20° 28' 54"	104° 24' 19"	Samneua,Xiengluang	Large		315,075,000	315,075,000
	5.8	Xiengluang limestone	20° 24' 00"	104° 13' 00"	Samneua,Xiengluang	Large		335,340,000	335,340,000
	5.9	Khangkhong limestone	20° 19' 06"	103° 07' 05"	Samneua,Khangkhong	Large		73,350,000	73,350,000
	5.10	Pha Nonghouaphou limestone	20° 43' 00"	104° 28' 00"	M. Thakhek, P. Khammouan	Large		10,790,000	10,790,000
	5.11	Ban Lao limestone	–	–	Ban Lao-Ban Mahaxay, P. Khammouan	Large		1,000,000,000	1,000,000,000
	5.12	Ban Nakhangxang limestone	20° 54' 00"	104° 13' 00"	M. Thakhek, P. Khammouan	Large		240,000,000	240,000,000
	5.13	Ban Taleo limestone	15° 54' 27"	106° 23' 25"	M. TaOi, P. Salavan	Middle		6,282,121	6,282,121
	Total						13,604,360	2,199,274,661	2,212,879,021
6. Marble	6.1	Pha Tao marble	–	–	Nam Ngum Basin, Vientiane	Middle		1,500,000	1,500,000
	Total							1,500,000	1,500,000

Appendix 3-3 Inventory of Industrial Materials (4)

SiO_2 98%		Alluvial	
KCl 15-19%, Av 15% $MgCl_2$ 10-28%, Av 19% KCl 19%, $MgCl_2$ 16% NaCl 52% KCl 17.5%, $MgCl_2$ 13%		Evaporite	Operating
CaO 51%, MgO 0.7%, SO_2 2.4% CaO 55%, MgO 0.5%, SO2 0.3% CaO 54%, MgO 0.5%, SO2 0.84% CaO 44-53%, MgO 0.3-3%, SO2 1.36% CaO 24%, MgO 0.53%, SO2 0.46% CaO 54%, MgO 0.69%, SO2 0.09% CaO 54%, MgO 2.88%, SO2 0.84% CaO 44-52%	 Low grade Low grade	Stratiform Stratiform Stratiform Stratiform Stratiform Stratiform Stratiform Stratiform Stratiform Stratiform Stratiform Stratiform Stratiform	

Appendix 3-3 Inventory of Industrial Materials (5)

7. Barite									
	7.1	Ban Non Hai barite	18° 08' 03"	101° 44' 20"	M. Phoung, Vientiane	Small	14,430		14,430
	7.2	Ban Done Hieng barite	–	–	M. Sanakham, Vientiane	Small		51,178	51,178
	7.3	Non Tong barite	18° 34' 43"	101° 59' 18"	M. Pheuang, P. Vientiane	Small		12,000	12,000
	Total						14,430	63,178	77,608
8. Phosphorite									
	8.1	Tham Bing phosphorite ore	17° 16' 20"	105° 02' 00"	M. Boualapha, P. Khammouan	Small		4,200	4,200
	8.2	Tham Khau phosphorite ore	17° 25' 45"	104° 51' 55"	M. Thakhek, P. Khammouan	Small	1,776	2,029	3,805
	8.3	Tham En phosphorite ore	18° 01' 20"	104° 25' 40"	M. Hinboun, P. Khammouan	Small		16,000	16,000
	8.4	Khuon Cuc1 phosphorite ore	17° 30' 07"	104° 49' 52"	M. Thakhek, P. Khammouan	Small		4,518	4,518
	8.5	Tham Khi Chia phosphorite ore	17° 28' 10"	104° 50' 45"	M. Thakhek, P. Khammouan	Small	2,292		2,292
	8.6	Tham Ngan phosphorite ore	17° 35' 25"	104° 44' 25"	M. Thakhek, P. Khammouan	Small	2,000		2,000
	8.7	Tham En2 phosphorite ore	17° 54' 07"	104° 33' 10"	M. Phontiou, P. Khammouan	Small	2,500	600	3,100
	8.8	Phosphorite in P. Vientian	–	–	P. Vientiane	Small		42435 m^3	42435 m^3
	Total						8,568	27,347	35,915

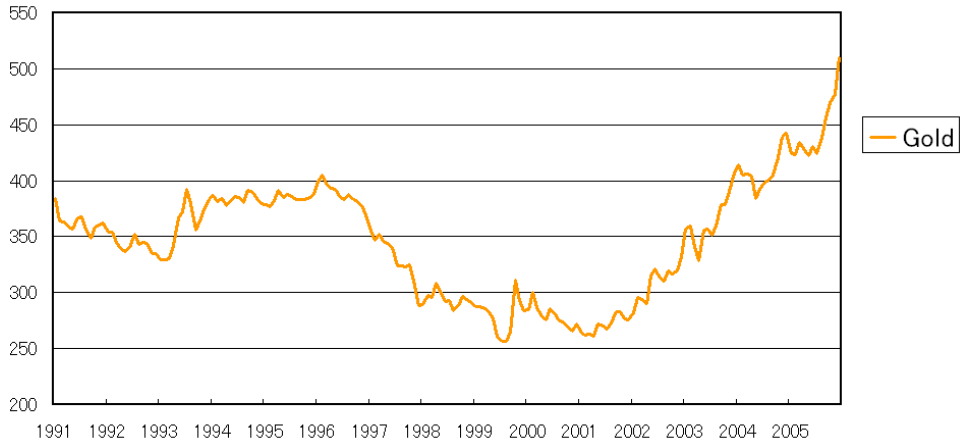
Mineral type	No.	Name of deposit	Coordinate		District,Province	Scale	Resources (cts)
			Latitude	Longitude			
9. Sapphire							
	9.1	Houei Say deposit	–	–	P. Bokeo	Middle	18,422,550
		Houei Sala I.1					4,438,200
		Houei Sala I.2					5,113,250
		Houei Sala II					8,795,500
		Houei Kok					75,600
	9.2	B. Houei Say deposit	–	–	P. Bokeo	Middle	4,840,000
	Total						23,262,550

Appendix 3-3 Inventory of Industrial Materials (6)

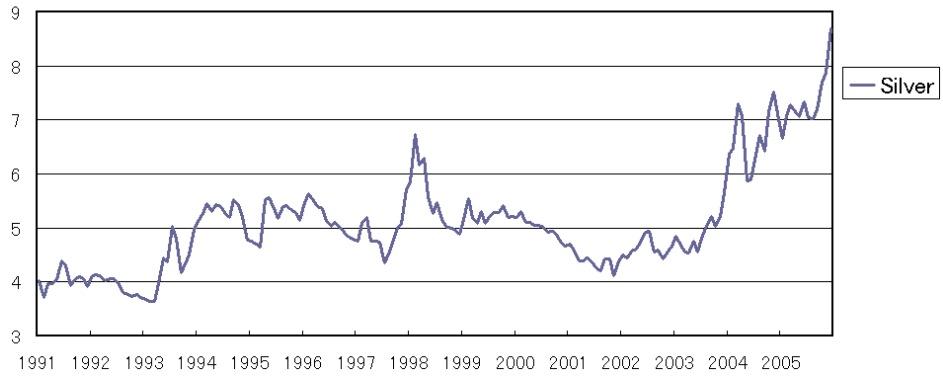
Ba 67% Ba 93-95% Ba 81-91%			
P_2O_5 6-19%, Av 14% P_2O_5 4-26%, Av 16% P_2O_5 7-34% P_2O_5 7-32%, Av 12% P_2O_5 8-26%, Av 13.5% P_2O_5 5-9%, Av 7.5% P_2O_5 8-22%, Av 7.5% P_2O_5 4%		Precipitation Precipitation Precipitation Precipitation Precipitation Precipitation Precipitation Precipitation	

Grade	Characteristic	Status
11.38 cts/m^3 9.93 cts/m^3 14 cts/m3 3 cts/m3 5.5 cts/m3	Volcanic Volocanic	Exploring by Ban Houei Say (Gem Mining Ltd) Exploring by Houei Say (Buhae Co.)

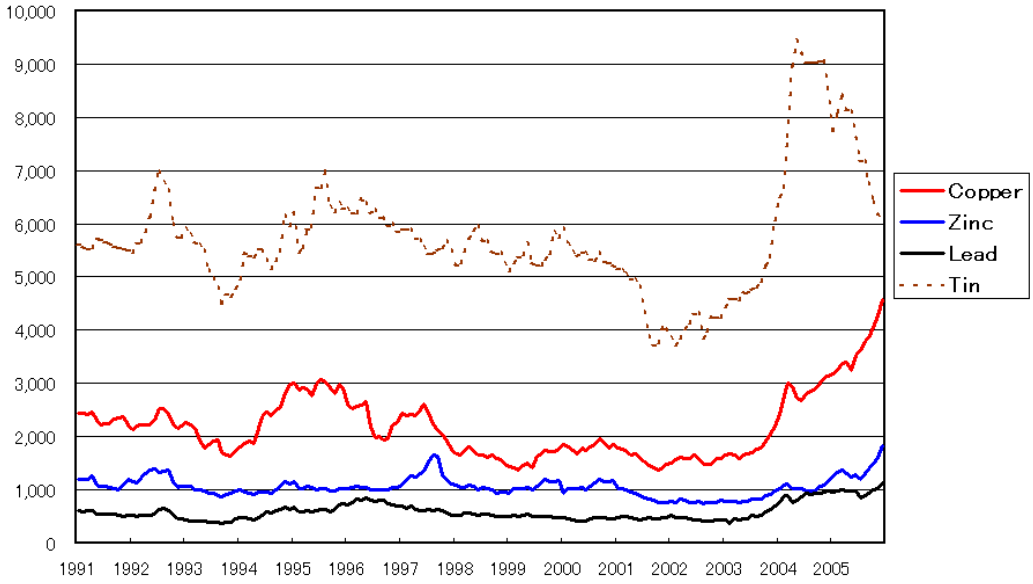
(US Dollars / Troy Ounce)



(US Dollars / Troy Ounce)



(US Dollars / t)



Appendix 4　15-Year Metals Price History

(Jan. 1991 to Dec. 2005)

Appendix 5-1 Economic Simulation of a Large-Scale Copper Deposit (1)

	Item	unit	Year 0	1	2	3	4	5	6	7	8	9	10
1	Ore reserves	'000 t	26,000	26,000	23,080	20,160	17,240	14,320	11,400	8,480	5,560	2,640	-280
2	Cu grade	Cu %	2.5										
3	Cu metal in reserves	'000 t	650										
	Production												
4	Production ore	t/day		8,000	8,000	8,000	8,000	8,000	8,000	8,000	8,000	8,000	8,000
5	Working day	day		365	365	365	365	365	365	365	365	365	365
6	Crude ore	'000 t		2,920	2,920	2,920	2,920	2,920	2,920	2,920	2,920	2,920	2,920
7	Cu grade in crude ore	Cu %		2.25	2.25	2.25	2.25	2.25	2.25	2.25	2.25	2.25	2.25
8	Cu metal in crude ore	Cu t		65,700	65,700	65,700	65,700	65,700	65,700	65,700	65,700	65,700	65,700
9	Cu recovery in processing	%		80	80	80	80	80	80	80	80	80	80
10	Cu metal product	Cu t		52,560	52,560	52,560	52,560	52,560	52,560	52,560	52,560	52,560	52,560
11	Copper price	$/t		1,700	1,700	1,700	1,700	1,700	1,700	1,700	1,700	1,700	1,700
12	Copper revenue	'000 $		89,352	89,352	89,352	89,352	89,352	89,352	89,352	89,352	89,352	89,352
13	Total Revenue	'000 $		89,352	89,352	89,352	89,352	89,352	89,352	89,352	89,352	89,352	89,352
	Cost												
14	Unit Cu mining & processing cost	$/t		20	20	20	20	20	20	20	20	20	20
15	Cu mining & processing cost	'000 $		58,400	58,400	58,400	58,400	58,400	58,400	58,400	58,400	58,400	58,400
16	Total Cost	'000 $		58,400	58,400	58,400	58,400	58,400	58,400	58,400	58,400	58,400	58,400
	Capital cost												
17	Exploration	'000 $	10,000										
18	Mining equipment	'000 $	40,000										
19	Processing equipment	'000 $	120,000										
20	Total capital cost	'000 $	170,000										
21	Depreciation	'000 $		17,000	17,000	17,000	17,000	17,000	17,000	17,000	17,000	17,000	17,000
22	Working capital	'000 $	34,000										
23	Royalties	'000 $		2.5	2.5	2.5	2.5	2.5	2.5	2.5	2.5	2.5	2.5
24	Royalties	'000 $		2,234	2,234	2,234	2,234	2,234	2,234	2,234	2,234	2,234	2,234
25	Profit	'000 $		11,718	11,718	11,718	11,718	11,718	11,718	11,718	11,718	11,718	11,718
26	Income tax	%		35	35	35	35	35	35	35	35	35	35
27	Income tax	'000 $		4,101	4,101	4,101	4,101	4,101	4,101	4,101	4,101	4,101	4,101
28	Net Cash Flow	'000 $	-204,000	24,617	24,617	24,617	24,617	24,617	24,617	24,617	24,617	24,617	24,617

Discount Rate		15%
Net Present Value	('000 $)	-69,960
Internal Rate of Return		4%

Appendix 5-1 Economic Simulation of a Large-Scale Copper Deposit (2)

	Item	unit	Year 0	1	2	3	4	5	6	7	8	9	10
1	Ore reserves	'000 t	26,000	26,000	23,080	20,160	17,240	14,320	11,400	8,480	5,560	2,640	-280
2	Cu grade	Cu %	2.5										
3	Cu metal in reserves	'000 t	650										
	Production												
4	Production ore	t/day		8,000	8,000	8,000	8,000	8,000	8,000	8,000	8,000	8,000	8,000
5	Working day	day		365	365	365	365	365	365	365	365	365	365
6	Crude ore	'000 t		2,920	2,920	2,920	2,920	2,920	2,920	2,920	2,920	2,920	2,920
7	Cu grade in crude ore	Cu %		2.25	2.25	2.25	2.25	2.25	2.25	2.25	2.25	2.25	2.25
8	Cu metal in crude ore	Cu t		65,700	65,700	65,700	65,700	65,700	65,700	65,700	65,700	65,700	65,700
9	Cu recovery in processing	%		80	80	80	80	80	80	80	80	80	80
10	Cu metal product	Cu t		52,560	52,560	52,560	52,560	52,560	52,560	52,560	52,560	52,560	52,560
11	Copper price	$/t		2,200	2,200	2,200	2,200	2,200	2,200	2,200	2,200	2,200	2,200
12	Copper revenue	'000 $		115,632	115,632	115,632	115,632	115,632	115,632	115,632	115,632	115,632	115,632
13	Total Revenue	'000 $		115,632	115,632	115,632	115,632	115,632	115,632	115,632	115,632	115,632	115,632
	Cost												
14	Unit Cu mining & processing cost	$/t		20	20	20	20	20	20	20	20	20	20
15	Cu mining & processing cost	'000 $		58,400	58,400	58,400	58,400	58,400	58,400	58,400	58,400	58,400	58,400
16	Total Cost	'000 $		58,400	58,400	58,400	58,400	58,400	58,400	58,400	58,400	58,400	58,400
	Capital cost												
17	Exploration	'000 $	10,000										
18	Mining equipment	'000 $	40,000										
19	Processing equipment	'000 $	120,000										
20	Total capital cost	'000 $	170,000										
21	Depreciation	'000 $		17,000	17,000	17,000	17,000	17,000	17,000	17,000	17,000	17,000	17,000
22	Working capital	'000 $	34,000										
23	Royalties	'000 $		2.5	2.5	2.5	2.5	2.5	2.5	2.5	2.5	2.5	2.5
24	Royalties	'000 $		2,891	2,891	2,891	2,891	2,891	2,891	2,891	2,891	2,891	2,891
25	Profit	'000 $		37,341	37,341	37,341	37,341	37,341	37,341	37,341	37,341	37,341	37,341
26	Income tax	%		35	35	35	35	35	35	35	35	35	35
27	Income tax	'000 $		13,069	13,069	13,069	13,069	13,069	13,069	13,069	13,069	13,069	13,069
28	Net Cash Flow	'000 $	-204,000	41,272	41,272	41,272	41,272	41,272	41,272	41,272	41,272	41,272	41,272

Discount Rate		15%
Net Present Value	('000 $)	2,725
Internal Rate of Return		15%

Appendix 5-1 Economic Simulation of a Large-Scale Copper Deposit (3)

	Item	unit	Year 0	1	2	3	4	5	6	7	8	9	10
1	Ore reserves	'000 t	26,000	26,000	23,080	20,160	17,240	14,320	11,400	8,480	5,560	2,640	-280
2	Cu grade	Cu %	2.5										
3	Cu metal in reserves	'000 t	650										
	Production												
4	Production ore	t/day		8,000	8,000	8,000	8,000	8,000	8,000	8,000	8,000	8,000	8,000
5	Working day	day		365	365	365	365	365	365	365	365	365	365
6	Crude ore	'000 t		2,920	2,920	2,920	2,920	2,920	2,920	2,920	2,920	2,920	2,920
7	Cu grade in crude ore	Cu %		2.25	2.25	2.25	2.25	2.25	2.25	2.25	2.25	2.25	2.25
8	Cu metal in crude ore	Cu t		65,700	65,700	65,700	65,700	65,700	65,700	65,700	65,700	65,700	65,700
9	Cu recovery in processing	%		80	80	80	80	80	80	80	80	80	80
10	Cu metal product	Cu t		52,560	52,560	52,560	52,560	52,560	52,560	52,560	52,560	52,560	52,560
11	Copper price	$/t		2,700	2,700	2,700	2,700	2,700	2,700	2,700	2,700	2,700	2,700
12	Copper revenue	'000 $		141,912	141,912	141,912	141,912	141,912	141,912	141,912	141,912	141,912	141,912
13	Total Revenue	'000 $		141,912	141,912	141,912	141,912	141,912	141,912	141,912	141,912	141,912	141,912
	Cost												
14	Unit Cu mining & processing cost	$/t		20	20	20	20	20	20	20	20	20	20
15	Cu mining & processing cost	'000 $		58,400	58,400	58,400	58,400	58,400	58,400	58,400	58,400	58,400	58,400
16	Total Cost	'000 $		58,400	58,400	58,400	58,400	58,400	58,400	58,400	58,400	58,400	58,400
	Capital cost												
17	Exploration	'000 $	10,000										
18	Mining equipment	'000 $	40,000										
19	Processing equipment	'000 $	120,000										
20	Total capital cost	'000 $	170,000										
21	Depreciation	'000 $		17,000	17,000	17,000	17,000	17,000	17,000	17,000	17,000	17,000	17,000
22	Working capital	'000 $	34,000										
23	Royalties	'000 $		2.5	2.5	2.5	2.5	2.5	2.5	2.5	2.5	2.5	2.5
24	Royalties	'000 $		3,548	3,548	3,548	3,548	3,548	3,548	3,548	3,548	3,548	3,548
25	Profit	'000 $		62,964	62,964	62,964	62,964	62,964	62,964	62,964	62,964	62,964	62,964
26	Income tax	%		35	35	35	35	35	35	35	35	35	35
27	Income tax	'000 $		22,037	22,037	22,037	22,037	22,037	22,037	22,037	22,037	22,037	22,037
28	Net Cash Flow	'000 $	-204,000	57,927	57,927	57,927	57,927	57,927	57,927	57,927	57,927	57,927	57,927

Discount Rate		15%
Net Present Value	('000 $)	75,409
Internal Rate of Return		25%

Appendix 5-2 Economic Simulation of a Small-Scale Copper Deposit (1)

	Item	unit	Year 0	1	2	3	4	5	6	7	8	9	10
1	Ore reserves	'000 t	4,500	4,500	3,989	3,478	2,967	2,456	1,945	1,434	923	412	-99
2	Cu grade	Cu %	3										
3	Cu metal in reserves	'000 t	135										
	Production												
4	Production ore	t/day		1,400	1,400	1,400	1,400	1,400	1,400	1,400	1,400	1,400	1,400
5	Working day	day		365	365	365	365	365	365	365	365	365	365
6	Crude ore	'000 t		511	511	511	511	511	511	511	511	511	511
7	Cu grade in crude ore	Cu %		2.70	2.70	2.70	2.70	2.70	2.70	2.70	2.70	2.70	2.70
8	Ag grade in crude ore	Ag g/t		10.0	10.0	10.0	10.0	10.0	10.0	10.0	10.0	10.0	10.0
9	Cu metal in crude ore	Cu t		13,797	13,797	13,797	13,797	13,797	13,797	13,797	13,797	13,797	13,797
10	Ag metal in crude ore	Ag kg		5,110	5,110	5,110	5,110	5,110	5,110	5,110	5,110	5,110	5,110
11	Cu concentrate	'000 t		35.8	35.8	35.8	35.8	35.8	35.8	35.8	35.8	35.8	35.8
12	Cu recovery in processing	%		95	95	95	95	95	95	95	95	95	95
13	Ag recovery in processing	%		60	60	60	60	60	60	60	60	60	60
14	Cu metal in concentrate	Cu t		13,107	13,107	13,107	13,107	13,107	13,107	13,107	13,107	13,107	13,107
15	Ag metal in concentrate	Ag kg		3,066	3,066	3,066	3,066	3,066	3,066	3,066	3,066	3,066	3,066
	Ag metal in concentrate	Ag oz		98,576	98,576	98,576	98,576	98,576	98,576	98,576	98,576	98,576	98,576
16	Copper price	$/t		1,700	1,700	1,700	1,700	1,700	1,700	1,700	1,700	1,700	1,700
17	Silver price	$/oz		5	5	5	5	5	5	5	5	5	5
18	Copper revenue	'000 $		22,282	22,282	22,282	22,282	22,282	22,282	22,282	22,282	22,282	22,282
19	Silver revenue	'000 $		493	493	493	493	493	493	493	493	493	493
20	Total Revenue	'000 $		22,775	22,775	22,775	22,775	22,775	22,775	22,775	22,775	22,775	22,775
	Cost												
21	Unit mining and processing cost	$/t		23	23	23	23	23	23	23	23	23	23
22	Unit transportation cost per conc.	$/t		20	20	20	20	20	20	20	20	20	20
23	Unit treatment and refinery charge	$/t		270	270	270	270	270	270	270	270	270	270
24	Mining and processing costs	'000 $		11,753	11,753	11,753	11,753	11,753	11,753	11,753	11,753	11,753	11,753
25	Transportation cost	'000 $		715	715	715	715	715	715	715	715	715	715
26	Treatment and refinery charges	'000 $		3,539	3,539	3,539	3,539	3,539	3,539	3,539	3,539	3,539	3,539
27	Total Cost	'000 $		16,007	16,007	16,007	16,007	16,007	16,007	16,007	16,007	16,007	16,007
	Capital cost												
28	Exploration	'000 $	2,000										
29	Mining equipment	'000 $	6,000										
30	Processing equipment	'000 $	22,000										
31	Total capital cost	'000 $	30,000										
32	Depreciation	'000 $		3,000	3,000	3,000	3,000	3,000	3,000	3,000	3,000	3,000	3,000
33	Working capital	'000 $	6,000										
34	Royalties	%		2.5	2.5	2.5	2.5	2.5	2.5	2.5	2.5	2.5	2.5
35	Royalties	'000 $		569	569	569	569	569	569	569	569	569	569
36	Profit	'000 $		3,198	3,198	3,198	3,198	3,198	3,198	3,198	3,198	3,198	3,198
37	Income tax	%		35	35	35	35	35	35	35	35	35	35
38	Income tax	'000' $		1,119	1,119	1,119	1,119	1,119	1,119	1,119	1,119	1,119	1,119
39	Net Cash Flow	'000 $	-36,000	5,079	5,079	5,079	5,079	5,079	5,079	5,079	5,079	5,079	5,079

Discount Rate		15%
Net Present Value	('000 $)	-9,139
Internal Rate of Return		7%

Appendix 5-2 Economic Simulation of a Small-Scale Copper Deposit (2)

	Item	unit	Year 0	1	2	3	4	5	6	7	8	9	10
1	Ore reserves	'000 t	4,500	4,500	3,989	3,478	2,967	2,456	1,945	1,434	923	412	-99
2	Cu grade	Cu %	3										
3	Cu metal in reserves	'000 t	135										
	Production												
4	Production ore	t/day		1,400	1,400	1,400	1,400	1,400	1,400	1,400	1,400	1,400	1,400
5	Working day	day		365	365	365	365	365	365	365	365	365	365
6	Crude ore	'000 t		511	511	511	511	511	511	511	511	511	511
7	Cu grade in crude ore	Cu %		2.70	2.70	2.70	2.70	2.70	2.70	2.70	2.70	2.70	2.70
8	Ag grade in crude ore	Ag g/t		10.0	10.0	10.0	10.0	10.0	10.0	10.0	10.0	10.0	10.0
9	Cu metal in crude ore	Cu t		13,797	13,797	13,797	13,797	13,797	13,797	13,797	13,797	13,797	13,797
10	Ag metal in crude ore	Ag kg		5,110	5,110	5,110	5,110	5,110	5,110	5,110	5,110	5,110	5,110
11	Cu concentrate	'000 t		35.8	35.8	35.8	35.8	35.8	35.8	35.8	35.8	35.8	35.8
12	Cu recovery in processing	%		95	95	95	95	95	95	95	95	95	95
13	Ag recovery in processing	%		60	60	60	60	60	60	60	60	60	60
14	Cu metal in concentrate	Cu t		13,107	13,107	13,107	13,107	13,107	13,107	13,107	13,107	13,107	13,107
15	Ag metal in concentrate	Ag kg		3,066	3,066	3,066	3,066	3,066	3,066	3,066	3,066	3,066	3,066
	Ag metal in concentrate	Ag oz		98,576	98,576	98,576	98,576	98,576	98,576	98,576	98,576	98,576	98,576
16	Copper price	$/t		2,200	2,200	2,200	2,200	2,200	2,200	2,200	2,200	2,200	2,200
17	Silver price	$/oz		5	5	5	5	5	5	5	5	5	5
18	Copper revenue	'000 $		28,836	28,836	28,836	28,836	28,836	28,836	28,836	28,836	28,836	28,836
19	Silver revenue	'000 $		493	493	493	493	493	493	493	493	493	493
20	Total Revenue	'000 $		29,329	29,329	29,329	29,329	29,329	29,329	29,329	29,329	29,329	29,329
	Cost												
21	Unit mining and processing cost	$/t		23	23	23	23	23	23	23	23	23	23
22	Unit transportation cost per conc.	$/t		20	20	20	20	20	20	20	20	20	20
23	Unit treatment and refinery charge	$/t		270	270	270	270	270	270	270	270	270	270
24	Mining and processing costs	'000 $		11,753	11,753	11,753	11,753	11,753	11,753	11,753	11,753	11,753	11,753
25	Transportation cost	'000 $		715	715	715	715	715	715	715	715	715	715
26	Treatment and refinery charges	'000 $		3,539	3,539	3,539	3,539	3,539	3,539	3,539	3,539	3,539	3,539
27	Total Cost	'000 $		16,007	16,007	16,007	16,007	16,007	16,007	16,007	16,007	16,007	16,007
	Capital cost												
28	Exploration	'000 $	2,000										
29	Mining equipment	'000 $	6,000										
30	Processing equipment	'000 $	22,000										
31	Total capital cost	'000 $	30,000										
32	Depreciation	'000 $		3,000	3,000	3,000	3,000	3,000	3,000	3,000	3,000	3,000	3,000
33	Working capital	'000 $	6,000										
34	Royalties	%		2.5	2.5	2.5	2.5	2.5	2.5	2.5	2.5	2.5	2.5
35	Royalties	'000 $		733	733	733	733	733	733	733	733	733	733
36	Profit	'000 $		9,588	9,588	9,588	9,588	9,588	9,588	9,588	9,588	9,588	9,588
37	Income tax	%		35	35	35	35	35	35	35	35	35	35
38	Income tax	'000' $		3,356	3,356	3,356	3,356	3,356	3,356	3,356	3,356	3,356	3,356
39	Net Cash Flow	'000 $	-36,000	9,232	9,232	9,232	9,232	9,232	9,232	9,232	9,232	9,232	9,232

Discount Rate		15%
Net Present Value	('000 $)	8,987
Internal Rate of Return		22%

Appendix 5-2 Economic Simulation of a Small-Scale Copper Deposit (3)

	Item	unit	Year 0	1	2	3	4	5	6	7	8	9	10
1	Ore reserves	'000 t	4,500	4,500	3,989	3,478	2,967	2,456	1,945	1,434	923	412	-99
2	Cu grade	Cu %	3										
3	Cu metal in reserves	'000 t	135										
	Production												
4	Production ore	t/day		1,400	1,400	1,400	1,400	1,400	1,400	1,400	1,400	1,400	1,400
5	Working day	day		365	365	365	365	365	365	365	365	365	365
6	Crude ore	'000 t		511	511	511	511	511	511	511	511	511	511
7	Cu grade in crude ore	Cu %		2.70	2.70	2.70	2.70	2.70	2.70	2.70	2.70	2.70	2.70
8	Ag grade in crude ore	Ag g/t		10.0	10.0	10.0	10.0	10.0	10.0	10.0	10.0	10.0	10.0
9	Cu metal in crude ore	Cu t		13,797	13,797	13,797	13,797	13,797	13,797	13,797	13,797	13,797	13,797
10	Ag metal in crude ore	Ag kg		5,110	5,110	5,110	5,110	5,110	5,110	5,110	5,110	5,110	5,110
11	Cu concentrate	'000 t		35.8	35.8	35.8	35.8	35.8	35.8	35.8	35.8	35.8	35.8
12	Cu recovery in processing	%		95	95	95	95	95	95	95	95	95	95
13	Ag recovery in processing	%		60	60	60	60	60	60	60	60	60	60
14	Cu metal in concentrate	Cu t		13,107	13,107	13,107	13,107	13,107	13,107	13,107	13,107	13,107	13,107
15	Ag metal in concentrate	Ag kg		3,066	3,066	3,066	3,066	3,066	3,066	3,066	3,066	3,066	3,066
	Ag metal in concentrate	Ag oz		98,576	98,576	98,576	98,576	98,576	98,576	98,576	98,576	98,576	98,576
16	Copper price	$/t		2,700	2,700	2,700	2,700	2,700	2,700	2,700	2,700	2,700	2,700
17	Silver price	$/oz		5	5	5	5	5	5	5	5	5	5
18	Copper revenue	'000 $		35,389	35,389	35,389	35,389	35,389	35,389	35,389	35,389	35,389	35,389
19	Silver revenue	'000 $		493	493	493	493	493	493	493	493	493	493
20	Total Revenue	'000 $		35,882	35,882	35,882	35,882	35,882	35,882	35,882	35,882	35,882	35,882
	Cost												
21	Unit mining and processing cost	$/t		23	23	23	23	23	23	23	23	23	23
22	Unit transportation cost per conc.	$/t		20	20	20	20	20	20	20	20	20	20
23	Unit treatment and refinery charge	$/t		270	270	270	270	270	270	270	270	270	270
24	Mining and processing costs	'000 $		11,753	11,753	11,753	11,753	11,753	11,753	11,753	11,753	11,753	11,753
25	Transportation cost	'000 $		715	715	715	715	715	715	715	715	715	715
26	Treatment and refinery charges	'000 $		3,539	3,539	3,539	3,539	3,539	3,539	3,539	3,539	3,539	3,539
27	Total Cost	'000 $		16,007	16,007	16,007	16,007	16,007	16,007	16,007	16,007	16,007	16,007
	Capital cost												
28	Exploration	'000 $	2,000										
29	Mining equipment	'000 $	6,000										
30	Processing equipment	'000 $	22,000										
31	Total capital cost	'000 $	30,000										
32	Depreciation	'000 $		3,000	3,000	3,000	3,000	3,000	3,000	3,000	3,000	3,000	3,000
33	Working capital	'000 $	6,000										
34	Royalties	%		2.5	2.5	2.5	2.5	2.5	2.5	2.5	2.5	2.5	2.5
35	Royalties	'000 $		897	897	897	897	897	897	897	897	897	897
36	Profit	'000 $		15,978	15,978	15,978	15,978	15,978	15,978	15,978	15,978	15,978	15,978
37	Income tax	%		35	35	35	35	35	35	35	35	35	35
38	Income tax	'000' $		5,592	5,592	5,592	5,592	5,592	5,592	5,592	5,592	5,592	5,592
39	Net Cash Flow	'000 $	-36,000	13,386	13,386	13,386	13,386	13,386	13,386	13,386	13,386	13,386	13,386

Discount Rate		15%
Net Present Value	('000 $)	27,112
Internal Rate of Return		35%

Appendix 5-3 Economic Simulation of a Middle-Scale Zinc Deposit (1)

	Item	unit	Year 0	1	2	3	4	5	6	7	8	9	10
1	Ore reserves	'000 t	4,000	4,000	3,562	3,124	2,686	2,248	1,810	1,372	934	496	58
2	Zn grade	Zn %	8.0										
3	Zn metal in reserves	'000 t	320										
	Production												
4	Production ore	t/day		1,200	1,200	1,200	1,200	1,200	1,200	1,200	1,200	1,200	1,200
5	Working day	day		365	365	365	365	365	365	365	365	365	365
6	Crude ore	'000 t		438	438	438	438	438	438	438	438	438	438
7	Zn grade in crude ore	Zn %		7.20	7.20	7.20	7.20	7.20	7.20	7.20	7.20	7.20	7.20
8	Pb grade in crude ore	Pb %		2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00
9	Ag grade in crude ore	Ag g/t		100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0
10	Zn metal in crude ore	Zn t		31,536	31,536	31,536	31,536	31,536	31,536	31,536	31,536	31,536	31,536
11	Pb metal in crude ore	Pb t		8,760	8,760	8,760	8,760	8,760	8,760	8,760	8,760	8,760	8,760
12	Ag metal in crude ore	Ag kg		43,800	43,800	43,800	43,800	43,800	43,800	43,800	43,800	43,800	43,800
11	Zn concentrate	'000 t		80.0	80.0	80.0	80.0	80.0	80.0	80.0	80.0	80.0	80.0
12	Zn recovery in processing	%		95	95	95	95	95	95	95	95	95	95
13	Pb recovery in processing	%		50	50	50	50	50	50	50	50	50	50
14	Ag recovery in processing	%		40	40	40	40	40	40	40	40	40	40
15	Zn metal in concentrate	Zn t		29,959	29,959	29,959	29,959	29,959	29,959	29,959	29,959	29,959	29,959
16	Pb metal in concentrate	Pb t		4,380	4,380	4,380	4,380	4,380	4,380	4,380	4,380	4,380	4,380
17	Ag metal in concentrate	Ag kg		17,520	17,520	17,520	17,520	17,520	17,520	17,520	17,520	17,520	17,520
	Ag metal in concentrate	Ag oz		563,290	563,290	563,290	563,290	563,290	563,290	563,290	563,290	563,290	563,290
18	Zinc price	$/t		800	800	800	800	800	800	800	800	800	800
19	Lead price	$/t		600	600	600	600	600	600	600	600	600	600
20	Silver price	$/oz		5	5	5	5	5	5	5	5	5	5
21	Zinc revenue	'000 $		23,967	23,967	23,967	23,967	23,967	23,967	23,967	23,967	23,967	23,967
22	Lead revenue	'000 $		2,628	2,628	2,628	2,628	2,628	2,628	2,628	2,628	2,628	2,628
23	Silver revenue	'000 $		2,816	2,816	2,816	2,816	2,816	2,816	2,816	2,816	2,816	2,816
20	Total Revenue	'000 $		29,412	29,412	29,412	29,412	29,412	29,412	29,412	29,412	29,412	29,412
	Cost												
21	Unit mining and processing cost	$/t		20	20	20	20	20	20	20	20	20	20
22	Unit transportation cost per conc.	$/t		20	20	20	20	20	20	20	20	20	20
23	Unit treatment charge	$/t		220	220	220	220	220	220	220	220	220	220
24	Mining and processing costs	'000 $		8,760	8,760	8,760	8,760	8,760	8,760	8,760	8,760	8,760	8,760
25	Transportation cost	'000 $		1,600	1,600	1,600	1,600	1,600	1,600	1,600	1,600	1,600	1,600
26	Treatment charge	'000 $		6,591	6,591	6,591	6,591	6,591	6,591	6,591	6,591	6,591	6,591
27	Total Cost	'000 $		16,951	16,951	16,951	16,951	16,951	16,951	16,951	16,951	16,951	16,951
	Capital cost												
28	Exploration	'000 $	2,000										
29	Mining equipment	'000 $	6,000										
30	Processing equipment	'000 $	32,000										
31	Total capital cost	'000 $	40,000										
32	Depreciation	'000 $		4,000	4,000	4,000	4,000	4,000	4,000	4,000	4,000	4,000	4,000
33	Working capital	'000 $	8,000										
34	Royalties	%		2.5	2.5	2.5	2.5	2.5	2.5	2.5	2.5	2.5	2.5
35	Royalties	'000 $		735	735	735	735	735	735	735	735	735	735
36	Profit	'000 $		7,725	7,725	7,725	7,725	7,725	7,725	7,725	7,725	7,725	7,725
37	Income tax	%		35	35	35	35	35	35	35	35	35	35
38	Income tax	'000 $		2,704	2,704	2,704	2,704	2,704	2,704	2,704	2,704	2,704	2,704
39	Net Cash Flow	'000 $	-48,000	9,022	9,022	9,022	9,022	9,022	9,022	9,022	9,022	9,022	9,022

Discount Rate		15%
Net Present Value	('000 $)	-2,368
Internal Rate of Return		13%

Appendix 5-3 Economic Simulation of a Middle-Scale Zinc Deposit (2)

			Year										
	Item	unit	0	1	2	3	4	5	6	7	8	9	10
1	Ore reserves	'000 t	4,000	4,000	3,562	3,124	2,686	2,248	1,810	1,372	934	496	58
2	Zn grade	Zn %	8.0										
3	Zn metal in reserves	'000 t	320										
	Production												
4	Production ore	t/day		1,200	1,200	1,200	1,200	1,200	1,200	1,200	1,200	1,200	1,200
5	Working day	day		365	365	365	365	365	365	365	365	365	365
6	Crude ore	'000 t		438	438	438	438	438	438	438	438	438	438
7	Zn grade in crude ore	Zn %		7.20	7.20	7.20	7.20	7.20	7.20	7.20	7.20	7.20	7.20
8	Pb grade in crude ore	Pb %		2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00
9	Ag grade in crude ore	Ag g/t		100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0
10	Zn metal in crude ore	Zn t		31,536	31,536	31,536	31,536	31,536	31,536	31,536	31,536	31,536	31,536
11	Pb metal in crude ore	Pb t		8,760	8,760	8,760	8,760	8,760	8,760	8,760	8,760	8,760	8,760
12	Ag metal in crude ore	Ag kg		43,800	43,800	43,800	43,800	43,800	43,800	43,800	43,800	43,800	43,800
11	Zn concentrate	'000 t		80.0	80.0	80.0	80.0	80.0	80.0	80.0	80.0	80.0	80.0
12	Zn recovery in processing	%		95	95	95	95	95	95	95	95	95	95
13	Pb recovery in processing	%		50	50	50	50	50	50	50	50	50	50
14	Ag recovery in processing	%		40	40	40	40	40	40	40	40	40	40
15	Zn metal in concentrate	Zn t		29,959	29,959	29,959	29,959	29,959	29,959	29,959	29,959	29,959	29,959
16	Pb metal in concentrate	Pb t		4,380	4,380	4,380	4,380	4,380	4,380	4,380	4,380	4,380	4,380
17	Ag metal in concentrate	Ag kg		17,520	17,520	17,520	17,520	17,520	17,520	17,520	17,520	17,520	17,520
	Ag metal in concentrate	Ag oz		563,290	563,290	563,290	563,290	563,290	563,290	563,290	563,290	563,290	563,290
18	Zinc price	$/t		1,000	1,000	1,000	1,000	1,000	1,000	1,000	1,000	1,000	1,000
19	Lead price	$/t		600	600	600	600	600	600	600	600	600	600
20	Silver price	$/oz		5	5	5	5	5	5	5	5	5	5
21	Zinc revenue	'000 $		29,959	29,959	29,959	29,959	29,959	29,959	29,959	29,959	29,959	29,959
22	Lead revenue	'000 $		2,628	2,628	2,628	2,628	2,628	2,628	2,628	2,628	2,628	2,628
23	Silver revenue	'000 $		2,816	2,816	2,816	2,816	2,816	2,816	2,816	2,816	2,816	2,816
20	Total Revenue	'000 $		35,404	35,404	35,404	35,404	35,404	35,404	35,404	35,404	35,404	35,404
	Cost												
21	Unit mining and processing cost	$/t		20	20	20	20	20	20	20	20	20	20
22	Unit transportation cost per conc.	$/t		20	20	20	20	20	20	20	20	20	20
23	Unit treatment charge	$/t		220	220	220	220	220	220	220	220	220	220
24	Mining and processing costs	'000 $		8,760	8,760	8,760	8,760	8,760	8,760	8,760	8,760	8,760	8,760
25	Transportation cost	'000 $		1,600	1,600	1,600	1,600	1,600	1,600	1,600	1,600	1,600	1,600
26	Treatment charge	'000 $		6,591	6,591	6,591	6,591	6,591	6,591	6,591	6,591	6,591	6,591
27	Total Cost	'000 $		16,951	16,951	16,951	16,951	16,951	16,951	16,951	16,951	16,951	16,951
	Capital cost												
28	Exploration	'000 $	2,000										
29	Mining equipment	'000 $	6,000										
30	Processing equipment	'000 $	32,000										
31	Total capital cost	'000 $	40,000										
32	Depreciation	'000 $		4,000	4,000	4,000	4,000	4,000	4,000	4,000	4,000	4,000	4,000
33	Working capital	'000 $	8,000										
34	Royalties	%		2.5	2.5	2.5	2.5	2.5	2.5	2.5	2.5	2.5	2.5
35	Royalties	'000 $		885	885	885	885	885	885	885	885	885	885
36	Profit	'000 $		13,568	13,568	13,568	13,568	13,568	13,568	13,568	13,568	13,568	13,568
37	Income tax	%		35	35	35	35	35	35	35	35	35	35
38	Income tax	'000 $		4,749	4,749	4,749	4,749	4,749	4,749	4,749	4,749	4,749	4,749
39	Net Cash Flow	'000 $	-48,000	12,819	12,819	12,819	12,819	12,819	12,819	12,819	12,819	12,819	12,819

Discount Rate		15%
Net Present Value	('000 $)	14,204
Internal Rate of Return		23%

Appendix 5-3 Economic Simulation of a Middle-Scale Zinc Deposit (3)

			Year										
	Item	unit	0	1	2	3	4	5	6	7	8	9	10
1	Ore reserves	'000 t	4,000	4,000	3,562	3,124	2,686	2,248	1,810	1,372	934	496	58
2	Zn grade	Zn %	8.0										
3	Zn metal in reserves	'000 t	320										
	Production												
4	Production ore	t/day		1,200	1,200	1,200	1,200	1,200	1,200	1,200	1,200	1,200	1,200
5	Working day	day		365	365	365	365	365	365	365	365	365	365
6	Crude ore	'000 t		438	438	438	438	438	438	438	438	438	438
7	Zn grade in crude ore	Zn %		7.20	7.20	7.20	7.20	7.20	7.20	7.20	7.20	7.20	7.20
8	Pb grade in crude ore	Pb %		2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00
9	Ag grade in crude ore	Ag g/t		100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0
10	Zn metal in crude ore	Zn t		31,536	31,536	31,536	31,536	31,536	31,536	31,536	31,536	31,536	31,536
11	Pb metal in crude ore	Pb t		8,760	8,760	8,760	8,760	8,760	8,760	8,760	8,760	8,760	8,760
12	Ag metal in crude ore	Ag kg		43,800	43,800	43,800	43,800	43,800	43,800	43,800	43,800	43,800	43,800
11	Zn concentrate	'000 t		80.0	80.0	80.0	80.0	80.0	80.0	80.0	80.0	80.0	80.0
12	Zn recovery in processing	%		95	95	95	95	95	95	95	95	95	95
13	Pb recovery in processing	%		50	50	50	50	50	50	50	50	50	50
14	Ag recovery in processing	%		40	40	40	40	40	40	40	40	40	40
15	Zn metal in concentrate	Zn t		29,959	29,959	29,959	29,959	29,959	29,959	29,959	29,959	29,959	29,959
16	Pb metal in concentrate	Pb t		4,380	4,380	4,380	4,380	4,380	4,380	4,380	4,380	4,380	4,380
17	Ag metal in concentrate	Ag kg		17,520	17,520	17,520	17,520	17,520	17,520	17,520	17,520	17,520	17,520
	Ag metal in concentrate	Ag oz		563,290	563,290	563,290	563,290	563,290	563,290	563,290	563,290	563,290	563,290
18	Zinc price	$/t		1,200	1,200	1,200	1,200	1,200	1,200	1,200	1,200	1,200	1,200
19	Lead price	$/t		600	600	600	600	600	600	600	600	600	600
20	Silver price	$/oz		5	5	5	5	5	5	5	5	5	5
21	Zinc revenue	'000 $		35,951	35,951	35,951	35,951	35,951	35,951	35,951	35,951	35,951	35,951
22	Lead revenue	'000 $		2,628	2,628	2,628	2,628	2,628	2,628	2,628	2,628	2,628	2,628
23	Silver revenue	'000 $		2,816	2,816	2,816	2,816	2,816	2,816	2,816	2,816	2,816	2,816
20	Total Revenue	'000 $		41,395	41,395	41,395	41,395	41,395	41,395	41,395	41,395	41,395	41,395
	Cost												
21	Unit mining and processing cost	$/t		20	20	20	20	20	20	20	20	20	20
22	Unit transportation cost per conc.	$/t		20	20	20	20	20	20	20	20	20	20
23	Unit treatment charge	$/t		220	220	220	220	220	220	220	220	220	220
24	Mining and processing costs	'000 $		8,760	8,760	8,760	8,760	8,760	8,760	8,760	8,760	8,760	8,760
25	Transportation cost	'000 $		1,600	1,600	1,600	1,600	1,600	1,600	1,600	1,600	1,600	1,600
26	Treatment charge	'000 $		6,591	6,591	6,591	6,591	6,591	6,591	6,591	6,591	6,591	6,591
27	Total Cost	'000 $		16,951	16,951	16,951	16,951	16,951	16,951	16,951	16,951	16,951	16,951
	Capital cost												
28	Exploration	'000 $	2,000										
29	Mining equipment	'000 $	6,000										
30	Processing equipment	'000 $	32,000										
31	Total capital cost	'000 $	40,000										
32	Depreciation	'000 $		4,000	4,000	4,000	4,000	4,000	4,000	4,000	4,000	4,000	4,000
33	Working capital	'000 $	8,000										
34	Royalties	%		2.5	2.5	2.5	2.5	2.5	2.5	2.5	2.5	2.5	2.5
35	Royalties	'000 $		1,035	1,035	1,035	1,035	1,035	1,035	1,035	1,035	1,035	1,035
36	Profit	'000 $		19,410	19,410	19,410	19,410	19,410	19,410	19,410	19,410	19,410	19,410
37	Income tax	%		35	35	35	35	35	35	35	35	35	35
38	Income tax	'000 $		6,793	6,793	6,793	6,793	6,793	6,793	6,793	6,793	6,793	6,793
39	Net Cash Flow	'000 $	-48,000	16,616	16,616	16,616	16,616	16,616	16,616	16,616	16,616	16,616	16,616

Discount Rate		15%
Net Present Value	('000 $)	30,777
Internal Rate of Return		33%

Appendix 5-4 Economic Simulation of a Large-Scale Gold Deposit (1)

			Year										
	Item	unit	0	1	2	3	4	5	6	7	8	9	10
1	Ore reserves	'000 t	17,000	17,000	15,175	13,350	11,525	9,700	7,875	6,050	4,225	2,400	575
2	Au grade	Au g/t	3.00										
3	Au metal in reserves	kg	51,000										
	Production												
4	Production ore	t/day		5,000	5,000	5,000	5,000	5,000	5,000	5,000	5,000	5,000	5,000
5	Working day	day		365	365	365	365	365	365	365	365	365	365
6	Crude ore	'000 t		1,825	1,825	1,825	1,825	1,825	1,825	1,825	1,825	1,825	1,825
7	Au grade in crude ore	Au g/t		2.85	2.85	2.85	2.85	2.85	2.85	2.85	2.85	2.85	2.85
8	Au metal in crude ore	Au kg		5,201	5,201	5,201	5,201	5,201	5,201	5,201	5,201	5,201	5,201
9	Au recovery in CIL	%		95	95	95	95	95	95	95	95	95	95
10	Au metal in CIL	Au kg		4,941	4,941	4,941	4,941	4,941	4,941	4,941	4,941	4,941	4,941
	Au metal in CIL	Au oz		158,865	158,865	158,865	158,865	158,865	158,865	158,865	158,865	158,865	158,865
11	Gold price	$/oz		300	300	300	300	300	300	300	300	300	300
12	Gold revenue	'000 $		47,660	47,660	47,660	47,660	47,660	47,660	47,660	47,660	47,660	47,660
13	Total Revenue	'000 $		47,660	47,660	47,660	47,660	47,660	47,660	47,660	47,660	47,660	47,660
	Cost												
14	Unit Au mining & treatment cost	$/t		20	20	20	20	20	20	20	20	20	20
15	Au mining & treatment cost	'000 $		36,500	36,500	36,500	36,500	36,500	36,500	36,500	36,500	36,500	36,500
16	Total Cost	'000 $		36,500	36,500	36,500	36,500	36,500	36,500	36,500	36,500	36,500	36,500
	Capital cost												
17	Exploration	'000 $	8,000										
18	Mining equipment	'000 $	20,000										
19	Processing equipment	'000 $	15,000										
20	Total capital cost	'000 $	43,000										
21	Depreciation	'000 $		4,300	4,300	4,300	4,300	4,300	4,300	4,300	4,300	4,300	4,300
22	Working capital	'000 $	8,000										
23	Royalties	%		2.5	2.5	2.5	2.5	2.5	2.5	2.5	2.5	2.5	2.5
24	Royalties	'000 $		1,191	1,191	1,191	1,191	1,191	1,191	1,191	1,191	1,191	1,191
25	Profit	'000 $		5,668	5,668	5,668	5,668	5,668	5,668	5,668	5,668	5,668	5,668
26	Income tax	%		35	35	35	35	35	35	35	35	35	35
27	Income tax	'000 $		1,984	1,984	1,984	1,984	1,984	1,984	1,984	1,984	1,984	1,984
28	Net Cash Flow	'000 $	-51,000	7,984	7,984	7,984	7,984	7,984	7,984	7,984	7,984	7,984	7,984

Discount Rate		15%
Net Present Value	('000 $)	-9,503
Internal Rate of Return		9%

Appendix 5-4 Economic Simulation of a Large-Scale Gold Deposit (2)

	Item	unit	Year 0	1	2	3	4	5	6	7	8	9	10
1	Ore reserves	'000 t	17,000	17,000	15,175	13,350	11,525	9,700	7,875	6,050	4,225	2,400	575
2	Au grade	Au g/t	3.00										
3	Au metal in reserves	kg	51,000										
	Production												
4	Production ore	t/day		5,000	5,000	5,000	5,000	5,000	5,000	5,000	5,000	5,000	5,000
5	Working day	day		365	365	365	365	365	365	365	365	365	365
6	Crude ore	'000 t		1,825	1,825	1,825	1,825	1,825	1,825	1,825	1,825	1,825	1,825
7	Au grade in crude ore	Au g/t		2.85	2.85	2.85	2.85	2.85	2.85	2.85	2.85	2.85	2.85
8	Au metal in crude ore	Au kg		5,201	5,201	5,201	5,201	5,201	5,201	5,201	5,201	5,201	5,201
9	Au recovery in CIL	%		95	95	95	95	95	95	95	95	95	95
10	Au metal in CIL	Au kg		4,941	4,941	4,941	4,941	4,941	4,941	4,941	4,941	4,941	4,941
	Au metal in CIL	Au oz		158,865	158,865	158,865	158,865	158,865	158,865	158,865	158,865	158,865	158,865
11	Gold price	$/oz		350	350	350	350	350	350	350	350	350	350
12	Gold revenue	'000 $		55,603	55,603	55,603	55,603	55,603	55,603	55,603	55,603	55,603	55,603
13	Total Revenue	'000 $		55,603	55,603	55,603	55,603	55,603	55,603	55,603	55,603	55,603	55,603
	Cost												
14	Unit Au mining & treatment cost	$/t		20	20	20	20	20	20	20	20	20	20
15	Au mining & treatment cost	'000 $		36,500	36,500	36,500	36,500	36,500	36,500	36,500	36,500	36,500	36,500
16	Total Cost	'000 $		36,500	36,500	36,500	36,500	36,500	36,500	36,500	36,500	36,500	36,500
	Capital cost												
17	Exploration	'000 $	8,000										
18	Mining equipment	'000 $	20,000										
19	Processing equipment	'000 $	15,000										
20	Total capital cost	'000 $	43,000										
21	Depreciation	'000 $		4,300	4,300	4,300	4,300	4,300	4,300	4,300	4,300	4,300	4,300
22	Working capital	'000 $	8,000										
23	Royalties	%		2.5	2.5	2.5	2.5	2.5	2.5	2.5	2.5	2.5	2.5
24	Royalties	'000 $		1,390	1,390	1,390	1,390	1,390	1,390	1,390	1,390	1,390	1,390
25	Profit	'000 $		13,413	13,413	13,413	13,413	13,413	13,413	13,413	13,413	13,413	13,413
26	Income tax	%		35	35	35	35	35	35	35	35	35	35
27	Income tax	'000 $		4,694	4,694	4,694	4,694	4,694	4,694	4,694	4,694	4,694	4,694
28	Net Cash Flow	'000 $	-51,000	13,018	13,018	13,018	13,018	13,018	13,018	13,018	13,018	13,018	13,018

Discount Rate		15%
Net Present Value	('000$)	12,466
Internal Rate of Return		22%

Appendix 5-4 Economic Simulation of a Large-Scale Gold Deposit (3)

	Item	unit	Year 0	1	2	3	4	5	6	7	8	9	10
1	Ore reserves	'000 t	17,000	17,000	15,175	13,350	11,525	9,700	7,875	6,050	4,225	2,400	575
2	Au grade	Au g/t	3.00										
3	Au metal in reserves	kg	51,000										
	Production												
4	Production ore	t/day		5,000	5,000	5,000	5,000	5,000	5,000	5,000	5,000	5,000	5,000
5	Working day	day		365	365	365	365	365	365	365	365	365	365
6	Crude ore	'000 t		1,825	1,825	1,825	1,825	1,825	1,825	1,825	1,825	1,825	1,825
7	Au grade in crude ore	Au g/t		2.85	2.85	2.85	2.85	2.85	2.85	2.85	2.85	2.85	2.85
8	Au metal in crude ore	Au kg		5,201	5,201	5,201	5,201	5,201	5,201	5,201	5,201	5,201	5,201
9	Au recovery in CIL	%		95	95	95	95	95	95	95	95	95	95
10	Au metal in CIL	Au kg		4,941	4,941	4,941	4,941	4,941	4,941	4,941	4,941	4,941	4,941
	Au metal in CIL	Au oz		158,865	158,865	158,865	158,865	158,865	158,865	158,865	158,865	158,865	158,865
11	Gold price	$/oz		400	400	400	400	400	400	400	400	400	400
12	Gold revenue	'000 $		63,546	63,546	63,546	63,546	63,546	63,546	63,546	63,546	63,546	63,546
13	Total Revenue	'000 $		63,546	63,546	63,546	63,546	63,546	63,546	63,546	63,546	63,546	63,546
	Cost												
14	Unit Au mining & treatment cost	$/t		20	20	20	20	20	20	20	20	20	20
15	Au mining & treatment cost	'000 $		36,500	36,500	36,500	36,500	36,500	36,500	36,500	36,500	36,500	36,500
16	Total Cost	'000 $		36,500	36,500	36,500	36,500	36,500	36,500	36,500	36,500	36,500	36,500
	Capital cost												
17	Exploration	'000 $	8,000										
18	Mining equipment	'000 $	20,000										
19	Processing equipment	'000 $	15,000										
20	Total capital cost	'000 $	43,000										
21	Depreciation	'000 $		4,300	4,300	4,300	4,300	4,300	4,300	4,300	4,300	4,300	4,300
22	Working capital	'000 $	8,000										
23	Royalties	%		2.5	2.5	2.5	2.5	2.5	2.5	2.5	2.5	2.5	2.5
24	Royalties	'000 $		1,589	1,589	1,589	1,589	1,589	1,589	1,589	1,589	1,589	1,589
25	Profit	'000 $		21,157	21,157	21,157	21,157	21,157	21,157	21,157	21,157	21,157	21,157
26	Income tax	%		35	35	35	35	35	35	35	35	35	35
27	Income tax	'000 $		7,405	7,405	7,405	7,405	7,405	7,405	7,405	7,405	7,405	7,405
28	Net Cash Flow	'000 $	-51,000	18,052	18,052	18,052	18,052	18,052	18,052	18,052	18,052	18,052	18,052

Discount Rate		15%
Net Present Value	('000$)	34,435
Internal Rate of Return		33%

Appendix 5-5 Economic Simulation of a Small-Scale Gold Deposit (1)

	Item	unit	Year 0	1	2	3	4	5	6	7	8	9	10
1	Ore reserves	'000 t	1,000	1,000	891	781	672	562	453	343	234	124	15
2	Au grade	Au g/t	4.0										
3	Au metal in reserves	kg	4,000										
	Production												
4	Production ore	t/day		300	300	300	300	300	300	300	300	300	300
5	Working day	day		365	365	365	365	365	365	365	365	365	365
6	Crude ore	'000 t		110	110	110	110	110	110	110	110	110	110
7	Au grade in crude ore	Au g/t		3.80	3.80	3.80	3.80	3.80	3.80	3.80	3.80	3.80	3.80
8	Au metal in crude ore	Au kg		416	416	416	416	416	416	416	416	416	416
9	Au recovery in CIP	%		92	92	92	92	92	92	92	92	92	92
10	Au metal in CIP	Au kg		383	383	383	383	383	383	383	383	383	383
	Au metal in CIP	Au oz		12,308	12,308	12,308	12,308	12,308	12,308	12,308	12,308	12,308	12,308
11	Au price	$/oz		300	300	300	300	300	300	300	300	300	300
12	Au revenue	'000 $		3,692	3,692	3,692	3,692	3,692	3,692	3,692	3,692	3,692	3,692
13	Total Revenue	'000 $		3,692	3,692	3,692	3,692	3,692	3,692	3,692	3,692	3,692	3,692
	Cost												
14	Unit mining and treatment cost	$/t		22	22	22	22	22	22	22	22	22	22
15	Mining and treatment costs	'000 $		2,420	2,420	2,420	2,420	2,420	2,420	2,420	2,420	2,420	2,420
16	Total Cost	'000 $		2,420	2,420	2,420	2,420	2,420	2,420	2,420	2,420	2,420	2,420
	Capital cost												
17	Exploration	'000 $	800										
18	Mining equipment	'000 $	1,500										
19	Processing equipment	'000 $	1,000										
20	Total capital cost	'000 $	3,300										
21	Depreciation	'000 $		330	330	330	330	330	330	330	330	330	330
22	Working capital	'000 $	600										
23	Royalties	%		2.5	2.5	2.5	2.5	2.5	2.5	2.5	2.5	2.5	2.5
24	Royalties	'000 $		92	92	92	92	92	92	92	92	92	92
25	Profit	'000 $		850	850	850	850	850	850	850	850	850	850
26	Income tax	%		35	35	35	35	35	35	35	35	35	35
27	Income tax	'000 $		298	298	298	298	298	298	298	298	298	298
28	Net Cash Flow	'000 $	-3,900	883	883	883	883	883	883	883	883	883	883

Discount Rate		15%
Net Present Value	('000 $)	460
Internal Rate of Return		18%

Appendix 5-5 Economic Simulation of a Small-Scale Gold Deposit (2)

	Item	unit	Year 0	1	2	3	4	5	6	7	8	9	10
1	Ore reserves	'000 t	1,000	1,000	891	781	672	562	453	343	234	124	15
2	Au grade	Au g/t	4.0										
3	Au metal in reserves	kg	4,000										
	Production												
4	Production ore	t/day		300	300	300	300	300	300	300	300	300	300
5	Working day	day		365	365	365	365	365	365	365	365	365	365
6	Crude ore	'000 t		110	110	110	110	110	110	110	110	110	110
7	Au grade in crude ore	Au g/t		3.80	3.80	3.80	3.80	3.80	3.80	3.80	3.80	3.80	3.80
8	Au metal in crude ore	Au kg		416	416	416	416	416	416	416	416	416	416
9	Au recovery in CIP	%		92	92	92	92	92	92	92	92	92	92
10	Au metal in CIP	Au kg		383	383	383	383	383	383	383	383	383	383
	Au metal in CIP	Au oz		12,308	12,308	12,308	12,308	12,308	12,308	12,308	12,308	12,308	12,308
11	Au price	$/oz		350	350	350	350	350	350	350	350	350	350
12	Au revenue	'000 $		4,308	4,308	4,308	4,308	4,308	4,308	4,308	4,308	4,308	4,308
13	Total Revenue	'000 $		4,308	4,308	4,308	4,308	4,308	4,308	4,308	4,308	4,308	4,308
	Cost												
14	Unit mining and treatment cost	$/t		22	22	22	22	22	22	22	22	22	22
15	Mining and treatment costs	'000 $		2,420	2,420	2,420	2,420	2,420	2,420	2,420	2,420	2,420	2,420
16	Total Cost	'000 $		2,420	2,420	2,420	2,420	2,420	2,420	2,420	2,420	2,420	2,420
	Capital cost												
17	Exploration	'000 $	800										
18	Mining equipment	'000 $	1,500										
19	Processing equipment	'000 $	1,000										
20	Total capital cost	'000 $	3,300										
21	Depreciation	'000 $		330	330	330	330	330	330	330	330	330	330
22	Working capital	'000 $	600										
23	Royalties	%		2.5	2.5	2.5	2.5	2.5	2.5	2.5	2.5	2.5	2.5
24	Royalties	'000 $		108	108	108	108	108	108	108	108	108	108
25	Profit	'000 $		1,450	1,450	1,450	1,450	1,450	1,450	1,450	1,450	1,450	1,450
26	Income tax	%		35	35	35	35	35	35	35	35	35	35
27	Income tax	'000 $		508	508	508	508	508	508	508	508	508	508
28	Net Cash Flow	'000 $	-3,900	1,273	1,273	1,273	1,273	1,273	1,273	1,273	1,273	1,273	1,273

Discount Rate		15%
Net Present Value	('000 $)	2,162
Internal Rate of Return		30%

Appendix 5-5 Economic Simulation of a Small-Scale Gold Deposit (3)

	Item	unit	Year 0	1	2	3	4	5	6	7	8	9	10
1	Ore reserves	'000 t	1,000	1,000	891	781	672	562	453	343	234	124	15
2	Au grade	Au g/t	4.0										
3	Au metal in reserves	kg	4,000										
	Production												
4	Production ore	t/day		300	300	300	300	300	300	300	300	300	300
5	Working day	day		365	365	365	365	365	365	365	365	365	365
6	Crude ore	'000 t		110	110	110	110	110	110	110	110	110	110
7	Au grade in crude ore	Au g/t		3.80	3.80	3.80	3.80	3.80	3.80	3.80	3.80	3.80	3.80
8	Au metal in crude ore	Au kg		416	416	416	416	416	416	416	416	416	416
9	Au recovery in CIP	%		92	92	92	92	92	92	92	92	92	92
10	Au metal in CIP	Au kg		383	383	383	383	383	383	383	383	383	383
	Au metal in CIP	Au oz		12,308	12,308	12,308	12,308	12,308	12,308	12,308	12,308	12,308	12,308
11	Au price	$/oz		400	400	400	400	400	400	400	400	400	400
12	Au revenue	'000 $		4,923	4,923	4,923	4,923	4,923	4,923	4,923	4,923	4,923	4,923
13	Total Revenue	'000 $		4,923	4,923	4,923	4,923	4,923	4,923	4,923	4,923	4,923	4,923
	Cost												
14	Unit mining and treatment cost	$/t		22	22	22	22	22	22	22	22	22	22
15	Mining and treatment costs	'000 $		2,420	2,420	2,420	2,420	2,420	2,420	2,420	2,420	2,420	2,420
16	Total Cost	'000 $		2,420	2,420	2,420	2,420	2,420	2,420	2,420	2,420	2,420	2,420
	Capital cost												
17	Exploration	'000 $	800										
18	Mining equipment	'000 $	1,500										
19	Processing equipment	'000 $	1,000										
20	Total capital cost	'000 $	3,300										
21	Depreciation	'000 $		330	330	330	330	330	330	330	330	330	330
22	Working capital	'000 $	600										
23	Royalties	%		2.5	2.5	2.5	2.5	2.5	2.5	2.5	2.5	2.5	2.5
24	Royalties	'000 $		123	123	123	123	123	123	123	123	123	123
25	Profit	'000 $		2,050	2,050	2,050	2,050	2,050	2,050	2,050	2,050	2,050	2,050
26	Income tax	%		35	35	35	35	35	35	35	35	35	35
27	Income tax	'000 $		718	718	718	718	718	718	718	718	718	718
28	Net Cash Flow	'000 $	-3,900	1,663	1,663	1,663	1,663	1,663	1,663	1,663	1,663	1,663	1,663

Discount Rate		15%
Net Present Value	('000 $)	3,864
Internal Rate of Return		41%

Appendix 6-1 Economic Simulation of a Gypsum Deposit (1)

	Item	unit	Year 0	1	2	3	4	5	6	7	8	9	10
1	Ore reserves	'000 t	5,000	5,000	4,916	4,832	4,748	4,664	4,580	4,496	4,412	4,328	4,244
2	Grade	SO_3 %	45										
	Production												
3	Production ore	t/day		350	350	350	350	350	350	350	350	350	350
4	Working day	day		240	240	240	240	240	240	240	240	240	240
5	Crude ore	'000 t		84	84	84	84	84	84	84	84	84	84
6	yield rate	%		95	95	95	95	95	95	95	95	95	95
7	Sales ore	'000 t		80	80	80	80	80	80	80	80	80	80
8	Gypsum price	$/t		20	20	20	20	20	20	20	20	20	20
9	Revenue	'000 $		1,680	1,680	1,680	1,680	1,680	1,680	1,680	1,680	1,680	1,680
10	Total Revenue	'000 $		1,680	1,680	1,680	1,680	1,680	1,680	1,680	1,680	1,680	1,680
	Cost												
11	Unit mining & processing costs	$/t		2	2	2	2	2	2	2	2	2	2
12	Unit transportation cost	$/t		15	15	15	15	15	15	15	15	15	15
13	Mining & processing costs	'000 $		168	168	168	168	168	168	168	168	168	168
14	Transportation cost	'000 $		1,260	1,260	1,260	1,260	1,260	1,260	1,260	1,260	1,260	1,260
15	Total Cost	'000 $		1,428	1,428	1,428	1,428	1,428	1,428	1,428	1,428	1,428	1,428
	Capital cost												
16	Exploration	'000 $	0										
17	Mining equipment	'000 $	1,000										
18	Processing equipment	'000 $	100										
19	Total capital cost	'000 $	1,100										
20	Depreciation	'000 $		110	110	110	110	110	110	110	110	110	110
21	Working capital	'000 $	275										
22	Royalties	%		2.5	2.5	2.5	2.5	2.5	2.5	2.5	2.5	2.5	2.5
23	Royalties	'000 $		42	42	42	42	42	42	42	42	42	42
24	Profit	'000 $		100	100	100	100	100	100	100	100	100	100
25	Income tax	%		35	35	35	35	35	35	35	35	35	35
26	Income tax	'000 $		35	35	35	35	35	35	35	35	35	35
27	Net Cash Flow	'000 $	-1,375	175	175	175	175	175	175	175	175	175	175

Discount Rate		15%
Net Present Value	('000 $)	-432
Internal Rate of Return		5%

Appendix 6-1 Economic Simulation of a Gypsum Deposit (2)

	Item	unit	Year 0	1	2	3	4	5	6	7	8	9	10
1	Ore reserves	'000 t	5,000	5,000	4,916	4,832	4,748	4,664	4,580	4,496	4,412	4,328	4,244
2	Grade	SO_3 %	45										
	Production												
3	Production ore	t/day		350	350	350	350	350	350	350	350	350	350
4	Working day	day		240	240	240	240	240	240	240	240	240	240
5	Crude ore	'000 t		84	84	84	84	84	84	84	84	84	84
6	yield rate	%		95	95	95	95	95	95	95	95	95	95
7	Sales ore	'000 t		80	80	80	80	80	80	80	80	80	80
8	Gypsum price	$/t		22	22	22	22	22	22	22	22	22	22
9	Revenue	'000 $		1,848	1,848	1,848	1,848	1,848	1,848	1,848	1,848	1,848	1,848
10	Total Revenue	'000 $		1,848	1,848	1,848	1,848	1,848	1,848	1,848	1,848	1,848	1,848
	Cost												
11	Unit mining & processing costs	$/t		2	2	2	2	2	2	2	2	2	2
12	Unit transportation cost	$/t		15	15	15	15	15	15	15	15	15	15
13	Mining & processing costs	'000 $		168	168	168	168	168	168	168	168	168	168
14	Transportation cost	'000 $		1,260	1,260	1,260	1,260	1,260	1,260	1,260	1,260	1,260	1,260
15	Total Cost	'000 $		1,428	1,428	1,428	1,428	1,428	1,428	1,428	1,428	1,428	1,428
	Capital cost												
16	Exploration	'000 $	0										
17	Mining equipment	'000 $	1,000										
18	Processing equipment	'000 $	100										
19	Total capital cost	'000 $	1,100										
20	Depreciation	'000 $		110	110	110	110	110	110	110	110	110	110
21	Working capital	'000 $	275										
22	Royalties	%		2.5	2.5	2.5	2.5	2.5	2.5	2.5	2.5	2.5	2.5
23	Royalties	'000 $		46	46	46	46	46	46	46	46	46	46
24	Profit	'000 $		264	264	264	264	264	264	264	264	264	264
25	Income tax	%		35	35	35	35	35	35	35	35	35	35
26	Income tax	'000 $		92	92	92	92	92	92	92	92	92	92
27	Net Cash Flow	'000 $	-1,375	281	281	281	281	281	281	281	281	281	281

Discount Rate		15%
Net Present Value	('000 $)	33
Internal Rate of Return		16%

Appendix 6-1 Economic Simulation of a Gypsum Deposit (3)

	Item	unit	Year 0	1	2	3	4	5	6	7	8	9	10
1	Ore reserves	'000 t	5,000	5,000	4,916	4,832	4,748	4,664	4,580	4,496	4,412	4,328	4,244
2	Grade	SO_3 %	45										
	Production												
3	Production ore	t/day		350	350	350	350	350	350	350	350	350	350
4	Working day	day		240	240	240	240	240	240	240	240	240	240
5	Crude ore	'000 t		84	84	84	84	84	84	84	84	84	84
6	yield rate	%		95	95	95	95	95	95	95	95	95	95
7	Sales ore	'000 t		80	80	80	80	80	80	80	80	80	80
8	Gypsum price	$/t		24	24	24	24	24	24	24	24	24	24
9	Revenue	'000 $		2,016	2,016	2,016	2,016	2,016	2,016	2,016	2,016	2,016	2,016
10	Total Revenue	'000 $		2,016	2,016	2,016	2,016	2,016	2,016	2,016	2,016	2,016	2,016
	Cost												
11	Unit mining & processing costs	$/t		2	2	2	2	2	2	2	2	2	2
12	Unit transportation cost	$/t		15	15	15	15	15	15	15	15	15	15
13	Mining & processing costs	'000 $		168	168	168	168	168	168	168	168	168	168
14	Transportation cost	'000 $		1,260	1,260	1,260	1,260	1,260	1,260	1,260	1,260	1,260	1,260
15	Total Cost	'000 $		1,428	1,428	1,428	1,428	1,428	1,428	1,428	1,428	1,428	1,428
	Capital cost												
16	Exploration	'000 $	0										
17	Mining equipment	'000 $	1,000										
18	Processing equipment	'000 $	100										
19	Total capital cost	'000 $	1,100										
20	Depreciation	'000 $		110	110	110	110	110	110	110	110	110	110
21	Working capital	'000 $	275										
22	Royalties	%		2.5	2.5	2.5	2.5	2.5	2.5	2.5	2.5	2.5	2.5
23	Royalties	'000 $		50	50	50	50	50	50	50	50	50	50
24	Profit	'000 $		428	428	428	428	428	428	428	428	428	428
25	Income tax	%		35	35	35	35	35	35	35	35	35	35
26	Income tax	'000 $		150	150	150	150	150	150	150	150	150	150
27	Net Cash Flow	'000 $	-1,375	388	388	388	388	388	388	388	388	388	388

Discount Rate		15%
Net Present Value	('000 $)	497
Internal Rate of Return		25%

Appendix 6-2 Economic Simulation of a Kaolin Deposit (1)

	Item	unit	Year 0	1	2	3	4	5	6	7	8	9	10
1	Ore reserves	'000 t	4,000	4,000	3,592	3,184	2,776	2,368	1,960	1,552	1,144	736	328
2	Grade	Al_2O_3 %	20										
	Production												
3	Production ore	t/day		1,700	1,700	1,700	1,700	1,700	1,700	1,700	1,700	1,700	1,500
4	Working day	day		240	240	240	240	240	240	240	240	240	240
5	Crude ore	'000 t		408	408	408	408	408	408	408	408	408	360
6	yield rate	%		25	25	25	25	25	25	25	25	25	25
7	Sales ore	'000 t		102	102	102	102	102	102	102	102	102	90
8	Kaolin price	$/t		70	70	70	70	70	70	70	70	70	70
9	Revenue	'000 $		7,140	7,140	7,140	7,140	7,140	7,140	7,140	7,140	7,140	6,300
10	Total Revenue	'000 $		7,140	7,140	7,140	7,140	7,140	7,140	7,140	7,140	7,140	6,300
	Cost												
11	Unit mining & processing costs	$/t		10	10	10	10	10	10	10	10	10	10
12	Unit transportation cost	$/t		15	15	15	15	15	15	15	15	15	15
13	Mining & processing costs	'000 $		4,080	4,080	4,080	4,080	4,080	4,080	4,080	4,080	4,080	3,600
14	Transportation cost	'000 $		1,530	1,530	1,530	1,530	1,530	1,530	1,530	1,530	1,530	1,350
15	Total Cost	'000 $		5,610	5,610	5,610	5,610	5,610	5,610	5,610	5,610	5,610	4,950
	Capital cost												
16	Exploration	'000 $	0										
17	Mining equipment	'000 $	5,000										
18	Processing equipment	'000 $	200										
19	Total capital cost	'000 $	5,200										
20	Depreciation	'000 $		520	520	520	520	520	520	520	520	520	520
21	Working capital	'000 $	1,300										
22	Royalties	%		2.5	2.5	2.5	2.5	2.5	2.5	2.5	2.5	2.5	2.5
23	Royalties	'000 $		179	179	179	179	179	179	179	179	179	158
24	Profit	'000 $		832	832	832	832	832	832	832	832	832	673
25	Income tax	%		35	35	35	35	35	35	35	35	35	35
26	Income tax	'000 $		291	291	291	291	291	291	291	291	291	235
27	Net Cash Flow	'000 $	-6,500	1,060	1,060	1,060	1,060	1,060	1,060	1,060	1,060	1,060	957

Discount Rate		15%
Net Present Value	('000 $)	-1,046
Internal Rate of Return		10%

Appendix 6-2 Economic Simulation of a Kaolin Deposit (2)

	Item	unit	Year 0	1	2	3	4	5	6	7	8	9	10
1	Ore reserves	'000 t	4,000	4,000	3,592	3,184	2,776	2,368	1,960	1,552	1,144	736	328
2	Grade	Al_2O_3 %	20										
	Production												
3	Production ore	t/day		1,700	1,700	1,700	1,700	1,700	1,700	1,700	1,700	1,700	1,700
4	Working day	day		240	240	240	240	240	240	240	240	240	240
5	Crude ore	'000 t		408	408	408	408	408	408	408	408	408	408
6	yield rate	%		25	25	25	25	25	25	25	25	25	25
7	Sales ore	'000 t		102	102	102	102	102	102	102	102	102	102
8	Kaolin price	$/t		80	80	80	80	80	80	80	80	80	80
9	Revenue	'000 $		8,160	8,160	8,160	8,160	8,160	8,160	8,160	8,160	8,160	8,160
10	Total Revenue	'000 $		8,160	8,160	8,160	8,160	8,160	8,160	8,160	8,160	8,160	8,160
	Cost												
11	Unit mining & processing costs	$/t		10	10	10	10	10	10	10	10	10	10
12	Unit transportation cost	$/t		15	15	15	15	15	15	15	15	15	15
13	Mining & processing costs	'000 $		4,080	4,080	4,080	4,080	4,080	4,080	4,080	4,080	4,080	4,080
14	Transportation cost	'000 $		1,530	1,530	1,530	1,530	1,530	1,530	1,530	1,530	1,530	1,530
15	Total Cost	'000 $		5,610	5,610	5,610	5,610	5,610	5,610	5,610	5,610	5,610	5,610
	Capital cost												
16	Exploration	'000 $	0										
17	Mining equipment	'000 $	5,000										
18	Processing equipment	'000 $	200										
19	Total capital cost	'000 $	5,200										
20	Depreciation	'000 $		520	520	520	520	520	520	520	520	520	520
21	Working capital	'000 $	1,300										
22	Royalties	%		2.5	2.5	2.5	2.5	2.5	2.5	2.5	2.5	2.5	2.5
23	Royalties	'000 $		204	204	204	204	204	204	204	204	204	204
24	Profit	'000 $		1,826	1,826	1,826	1,826	1,826	1,826	1,826	1,826	1,826	1,826
25	Income tax	%		35	35	35	35	35	35	35	35	35	35
26	Income tax	'000 $		639	639	639	639	639	639	639	639	639	639
27	Net Cash Flow	'000 $	-6,500	1,707	1,707	1,707	1,707	1,707	1,707	1,707	1,707	1,707	1,707

Discount Rate		15%
Net Present Value	('000 $)	1,797
Internal Rate of Return		23%

Appendix 6-2 Economic Simulation of a Kaolin Deposit (3)

	Item	unit	Year 0	1	2	3	4	5	6	7	8	9	10
1	Ore reserves	'000 t	4,000	4,000	3,592	3,184	2,776	2,368	1,960	1,552	1,144	736	328
2	Grade	Al_2O_3 %	20										
	Production												
3	Production ore	t/day		1,700	1,700	1,700	1,700	1,700	1,700	1,700	1,700	1,700	1,700
4	Working day	day		240	240	240	240	240	240	240	240	240	240
5	Crude ore	'000 t		408	408	408	408	408	408	408	408	408	408
6	yield rate	%		25	25	25	25	25	25	25	25	25	25
7	Sales ore	'000 t		102	102	102	102	102	102	102	102	102	102
8	Kaolin price	$/t		90	90	90	90	90	90	90	90	90	90
9	Revenue	'000 $		9,180	9,180	9,180	9,180	9,180	9,180	9,180	9,180	9,180	9,180
10	Total Revenue	'000 $		9,180	9,180	9,180	9,180	9,180	9,180	9,180	9,180	9,180	9,180
	Cost												
11	Unit mining & processing costs	$/t		10	10	10	10	10	10	10	10	10	10
12	Unit transportation cost	$/t		15	15	15	15	15	15	15	15	15	15
13	Mining & processing costs	'000 $		4,080	4,080	4,080	4,080	4,080	4,080	4,080	4,080	4,080	4,080
14	Transportation cost	'000 $		1,530	1,530	1,530	1,530	1,530	1,530	1,530	1,530	1,530	1,530
15	Total Cost	'000 $		5,610	5,610	5,610	5,610	5,610	5,610	5,610	5,610	5,610	5,610
	Capital cost												
16	Exploration	'000 $	0										
17	Mining equipment	'000 $	5,000										
18	Processing equipment	'000 $	200										
19	Total capital cost	'000 $	5,200										
20	Depreciation	'000 $		520	520	520	520	520	520	520	520	520	520
21	Working capital	'000 $	1,300										
22	Royalties	%		2.5	2.5	2.5	2.5	2.5	2.5	2.5	2.5	2.5	2.5
23	Royalties	'000 $		230	230	230	230	230	230	230	230	230	230
24	Profit	'000 $		2,821	2,821	2,821	2,821	2,821	2,821	2,821	2,821	2,821	2,821
25	Income tax	%		35	35	35	35	35	35	35	35	35	35
26	Income tax	'000 $		987	987	987	987	987	987	987	987	987	987
27	Net Cash Flow	'000 $	-6,500	2,353	2,353	2,353	2,353	2,353	2,353	2,353	2,353	2,353	2,353

Discount Rate		15%
Net Present Value	('000 $)	4,618
Internal Rate of Return		34%

Appendix 6-3 Economic Simulation of a Potash Salt Deposit (1)

	Item	unit	Year 0	1	2	3	4	5	6	7	8	9	10
1	Ore reserves	'000 t	20,000	20,000	19,640	19,280	18,920	18,560	18,200	17,840	17,480	17,120	16,760
2	Grade	KCl %	18										
	Production												
3	Production ore	t/day		1,500	1,500	1,500	1,500	1,500	1,500	1,500	1,500	1,500	1,500
4	Working day	day		240	240	240	240	240	240	240	240	240	240
5	Crude ore	'000 t		360	360	360	360	360	360	360	360	360	360
6	yield rate	%		95	95	95	95	95	95	95	95	95	95
7	KCl ore	'000 t		62	62	62	62	62	62	62	62	62	62
8	KCl price	$/t		140	140	140	140	140	140	140	140	140	140
9	Revenue (K_2O 100% conversion)	'000 $		5,171	5,171	5,171	5,171	5,171	5,171	5,171	5,171	5,171	5,171
10	Total Revenue	'000 $		5,171	5,171	5,171	5,171	5,171	5,171	5,171	5,171	5,171	5,171
	Cost												
11	Unit mining & processing costs	$/t		5	5	5	5	5	5	5	5	5	5
12	Unit transportation cost	$/t		15	15	15	15	15	15	15	15	15	15
13	Mining & processing costs	'000 $		1,800	1,800	1,800	1,800	1,800	1,800	1,800	1,800	1,800	1,800
14	Transportation cost	'000 $		923	923	923	923	923	923	923	923	923	923
15	Total Cost	'000 $		2,723	2,723	2,723	2,723	2,723	2,723	2,723	2,723	2,723	2,723
	Capital cost												
16	Exploration	'000 $	0										
17	Mining equipment	'000 $	4,500										
18	Processing equipment	'000 $	2,000										
19	Total capital cost	'000 $	6,500										
20	Depreciation	'000 $		650	650	650	650	650	650	650	650	650	650
21	Working capital	'000 $	1,300										
22	Royalties	%		2.5	2.5	2.5	2.5	2.5	2.5	2.5	2.5	2.5	2.5
23	Royalties	'000 $		129	129	129	129	129	129	129	129	129	129
24	Profit	'000 $		1,668	1,668	1,668	1,668	1,668	1,668	1,668	1,668	1,668	1,668
25	Income tax	%		35	35	35	35	35	35	35	35	35	35
26	Income tax	'000 $		584	584	584	584	584	584	584	584	584	584
27	Net Cash Flow	'000 $	-7,800	1,734	1,734	1,734	1,734	1,734	1,734	1,734	1,734	1,734	1,734

Discount Rate		15%
Net Present Value	('000 $)	787
Internal Rate of Return		18%

Appendix 6-3 Economic Simulation of a Potash Salt Deposit (2)

	Item	unit	Year 0	1	2	3	4	5	6	7	8	9	10
1	Ore reserves	'000 t	20,000	20,000	19,640	19,280	18,920	18,560	18,200	17,840	17,480	17,120	16,760
2	Grade	KCl %	18										
	Production												
3	Production ore	t/day		1,500	1,500	1,500	1,500	1,500	1,500	1,500	1,500	1,500	1,500
4	Working day	day		240	240	240	240	240	240	240	240	240	240
5	Crude ore	'000 t		360	360	360	360	360	360	360	360	360	360
6	yield rate	%		95	95	95	95	95	95	95	95	95	95
7	KCl ore	'000 t		62	62	62	62	62	62	62	62	62	62
8	KCl price	$/t		160	160	160	160	160	160	160	160	160	160
9	Revenue (K_2O 100% conversion)	'000 $		5,910	5,910	5,910	5,910	5,910	5,910	5,910	5,910	5,910	5,910
10	Total Revenue	'000 $		5,910	5,910	5,910	5,910	5,910	5,910	5,910	5,910	5,910	5,910
	Cost												
11	Unit mining & processing costs	$/t		5	5	5	5	5	5	5	5	5	5
12	Unit transportation cost	$/t		15	15	15	15	15	15	15	15	15	15
13	Mining & processing costs	'000 $		1,800	1,800	1,800	1,800	1,800	1,800	1,800	1,800	1,800	1,800
14	Transportation cost	'000 $		923	923	923	923	923	923	923	923	923	923
15	Total Cost	'000 $		2,723	2,723	2,723	2,723	2,723	2,723	2,723	2,723	2,723	2,723
	Capital cost												
16	Exploration	'000 $	0										
17	Mining equipment	'000 $	4,500										
18	Processing equipment	'000 $	2,000										
19	Total capital cost	'000 $	6,500										
20	Depreciation	'000 $		650	650	650	650	650	650	650	650	650	650
21	Working capital	'000 $	1,300										
22	Royalties	%		2.5	2.5	2.5	2.5	2.5	2.5	2.5	2.5	2.5	2.5
23	Royalties	'000 $		148	148	148	148	148	148	148	148	148	148
24	Profit	'000 $		2,389	2,389	2,389	2,389	2,389	2,389	2,389	2,389	2,389	2,389
25	Income tax	%		35	35	35	35	35	35	35	35	35	35
26	Income tax	'000 $		836	836	836	836	836	836	836	836	836	836
27	Net Cash Flow	'000 $	-7,800	2,203	2,203	2,203	2,203	2,203	2,203	2,203	2,203	2,203	2,203

Discount Rate		15%
Net Present Value	('000 $)	2,830
Internal Rate of Return		25%

Appendix 6-3 Economic Simulation of a Potash Salt Deposit (3)

	Item	unit	Year 0	1	2	3	4	5	6	7	8	9	10
1	Ore reserves	'000 t	20,000	20,000	19,640	19,280	18,920	18,560	18,200	17,840	17,480	17,120	16,760
2	Grade	KCl %	18										
	Production												
3	Production ore	t/day		1,500	1,500	1,500	1,500	1,500	1,500	1,500	1,500	1,500	1,500
4	Working day	day		240	240	240	240	240	240	240	240	240	240
5	Crude ore	'000 t		360	360	360	360	360	360	360	360	360	360
6	yield rate	%		95	95	95	95	95	95	95	95	95	95
7	KCl ore	'000 t		62	62	62	62	62	62	62	62	62	62
8	KCl price	$/t		180	180	180	180	180	180	180	180	180	180
9	Revenue (K_2O 100% conversion)	'000 $		6,648	6,648	6,648	6,648	6,648	6,648	6,648	6,648	6,648	6,648
10	Total Revenue	'000 $		6,648	6,648	6,648	6,648	6,648	6,648	6,648	6,648	6,648	6,648
	Cost												
11	Unit mining & processing costs	$/t		5	5	5	5	5	5	5	5	5	5
12	Unit transportation cost	$/t		15	15	15	15	15	15	15	15	15	15
13	Mining & processing costs	'000 $		1,800	1,800	1,800	1,800	1,800	1,800	1,800	1,800	1,800	1,800
14	Transportation cost	'000 $		923	923	923	923	923	923	923	923	923	923
15	Total Cost	'000 $		2,723	2,723	2,723	2,723	2,723	2,723	2,723	2,723	2,723	2,723
	Capital cost												
16	Exploration	'000 $	0										
17	Mining equipment	'000 $	4,500										
18	Processing equipment	'000 $	2,000										
19	Total capital cost	'000 $	6,500										
20	Depreciation	'000 $		650	650	650	650	650	650	650	650	650	650
21	Working capital	'000 $	1,300										
22	Royalties	%		2.5	2.5	2.5	2.5	2.5	2.5	2.5	2.5	2.5	2.5
23	Royalties	'000 $		166	166	166	166	166	166	166	166	166	166
24	Profit	'000 $		3,109	3,109	3,109	3,109	3,109	3,109	3,109	3,109	3,109	3,109
25	Income tax	%		35	35	35	35	35	35	35	35	35	35
26	Income tax	'000 $		1,088	1,088	1,088	1,088	1,088	1,088	1,088	1,088	1,088	1,088
27	Net Cash Flow	'000 $	-7,800	2,671	2,671	2,671	2,671	2,671	2,671	2,671	2,671	2,671	2,671

Discount Rate		15%
Net Present Value	('000 $)	4,873
Internal Rate of Return		32%

Appendix 7-1 Cost Estimate for Creation of a 1: 50,000 Geological Map

Description	Quantity	Unit	Unit Price (US$)	Amount (US$)	Man-month	Number of consultants	Working place
1. Remuneration							
1) Preparation for geological survey	0.5	man-month	20,000	10,000	0.25	2	Lao
2) Geological survey	6.9	man-month	20,000	138,000	2.3	3	Lao
3) Compilation	2.8	man-month	20,000	55,200	0.9	3	Lao
4) Analyzing data	4.1	man-month	20,000	82,800	1.4	3	out*)
5) Producing report and digital map, and rendering in GIS	2.0	man-month	20,000	40,000	1.0	2	out*)
Total				**326,000**			*) out of Lao PDR
2. Reimbursables							
1) International flights	8	trip	2,500	20,000			
2) Substance allowance	305	man-day	150	45,700			
3) Local transportation cost							
Car rental (Passenger car)	35	car-day	50	1,800			
Car rental (4WD) including fuel	207	car-day	200	41,400			
4) Laboratory test cost							
Whole rock analysis	**10**	sample	30	300			
Chemical analysis of rocks and ores	**70**	sample	40	2,800			
Dating	**6**	sample	500	3,000			
Making thin section and observation	**80**	sample	250	20,000			
Making polished thin section and observation	**40**	sample	300	12,000			
X-ray diffraction analysis	**30**	sample	100	3,000			
5) Assistance							
Field assistant	414	man-day	20	8,300			
Assistant in Vientiane office	51	man-day	20	1,000			
Total				**159,300**			
3. Miscellaneous expenses							
1) Communication costs (telephone, facsimile)	1	set	1,000	1,000			
2) Geological equipment	3	set	1,000	3,000			
3) Drafting, reproduction of reports	1	set	300	300			
4) Reproduction of digital maps	200	set	50	10,000			
5) Renewal of the office	1	set	2,000	2,000			
Total				**16,300**			
Grand Total				**501,600**			

Appendix 7-2 Cost Estimate for Creation of a 1: 2,000 Geological Map

Description	Quantity	Unit	Unit Price (US$)	Amount (US$)	Man-month	Number of consultants	Working place
1. Remuneration							
1) Preparation for geological survey	0.2	man-month	20,000	4,000	0.2	1	Lao
2) Geological survey	0.7	man-month	20,000	14,000	0.35	2	Lao
3) Compilation	0.2	man-month	20,000	4,200	0.11	2	Lao
4) Analyzing data	0.4	man-month	20,000	8,000	0.2	2	out*)
5) Producing report and digital map, and rendering in GIS	0.3	man-month	20,000	6,000	0.3	1	out*)
Total				**36,200**			*) out of Lao PDR
2. Reimbursables							
1) International flights	2	trip	2,500	5,000			
2) Substance allowance	33	man-day	150	5,000			
3) Local transportation cost							
Car rental (Passenger car)	10	day	50	500			
Car rental (4WD)	21	day	200	4,200			
4) Trenching							
1m (W) x 1m (D) x 50m (L)	10	man-day	20	200			
5) Laboratory test cost							
Chemical analysis of rocks and ores	20	sample	40	800			
Making thin section and observation	25	sample	250	6,300			
Making polished thin section and observation	10	sample	300	3,000			
X-ray diffraction analysis	10	sample	100	1,000			
6) Assistance							
Field assistant	84	man-day	20	1,700			
Assistant in Vientiane office	13	man-day	20	300			
Total				**28,000**			
3. Miscellaneous expenses							
1) Communication costs (telephone, facsimile)	1	set	500	500			
2) Drafting, reproduction of reports	1	set	200	200			
3) Reproduction of digital maps	100	set	50	5,000			
4) Renewal of the office	1	set	1,000	1,000			
Total				**6,700**			
Grand Total				**70,900**			

Appendix 7-3 Cost Estimate for Information Package and Laboratory Equipment

I. Information Package

Description	Quantity	Unit	Unit Price (US$)	Amount (US$)	Man-month	Number of consultants	Working place
1. Remuneration							
1) Compilation	0.20	man-month	20,000	4,000	0.20	1	out*)
Total				**4,000**			

*) out of Lao PDR

2. Reimbursables				
1) Assistant	0.22	man-day	6,000	1,300
Total				**1,300**
3. Miscellaneous expenses				
1) Drafting, production of package	1	set	200	200
2) Printing	500	sheet	3	1,500
Total				**1,700**
Grand Total				**7,000**

II. Laboratory Equipment

Description	Quantity	Unit	Unit Price (US$)	Amount (US$)
1. Equipment				
1) Microscope	1	set	50,000	50,000
2) X-ray Diffractometer	1	set	100,000	100,000
3) X-ray fluorescence analyzer	1	set	150,000	150,000
4) ICP (Inductively Coupled Plasma Atomic Emission Spectrometry)	1	set	150,000	150,000
5) Sample preparation	1	set	50,000	50,000
Total				**500,000**
Grand Total				**500,000**

Appendix 7-4 Cost Estimate for a Structural Drilling

Description	Quantity	Unit	Unit Price (US$)	Amount (US$)	Man-month	Number of consultants	Working place
1. Remuneration							
1) Observation of drilled core	2.0	man-month	20,000	40,000	2.0	1	Lao
2) Compilation	0.3	man-month	20,000	6,000	0.3	1	Lao
3) Producing report and digital map, and rendering in GIS	0.3	man-month	20,000	6,000	0.3	1	out*)
Total				**52,000**			

*) out of Lao PDR

Description	Quantity	Unit	Unit Price (US$)	Amount (US$)
2. Drilling Work				
1) Direct drill work	500	meter	100	50,000
2) Indirect drilling work	500	set	130	65,000
Total				**115,000**
2. Reimbursables				
1) International flights	1	trip	2,500	2,500
2) Substance allowance	69	man-day	150	10,400
3) Local transportation cost				
Car rental (Passenger car)	9	day	50	500
Car rental (4WD)	60	day	200	12,000
4) Laboratory test cost				
Making thin section and observation	**20**	sample	250	5,000
Making polished thin section and observation	**5**	sample	300	1,500
X-ray diffraction analysis	**10**	sample	100	1,000
6) Assistance				
Field assistant	0	man-day	20	0
Assistant in Vientiane office	7	man-day	20	100
Total				**33,000**
Grand Total				**200,000**